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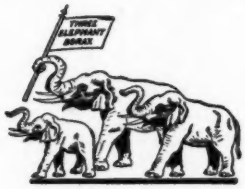

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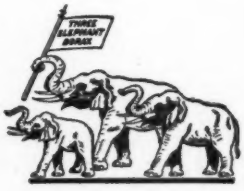

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington, D. C.

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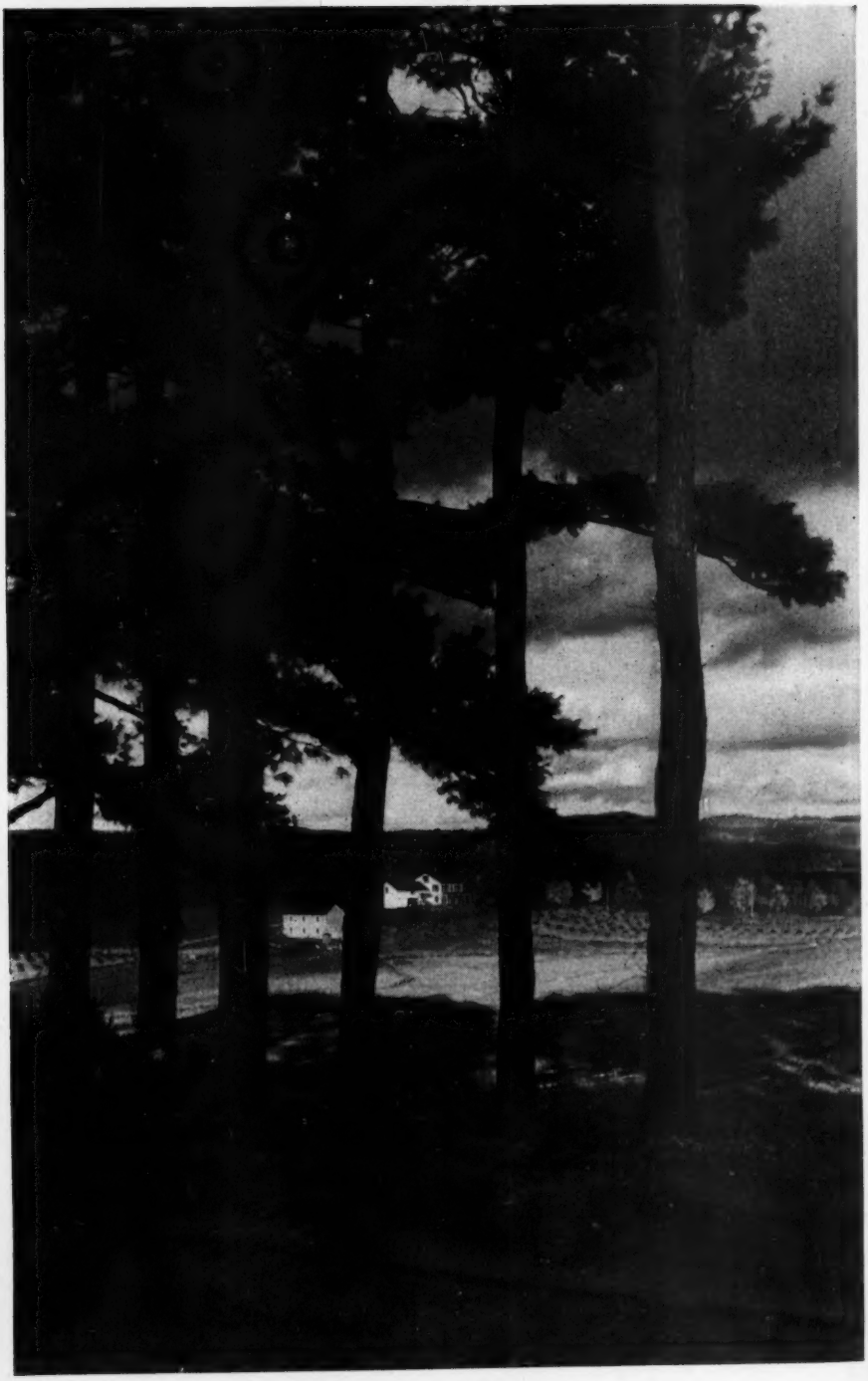

THEY STAND LIKE SENTINELS!

Better Crops with PLANT FOOD

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Vol. XXVI WASHINGTON, D. C., AUGUST-SEPTEMBER 1942 No. 7

United to overcome . . .

The Daze Phase

Jeff McDermid

MY SEGMENT of America seems to be in a coma for the present—not a complacent unawareness and indifference, but a queer form of hysteria surrounded by a nebulous vacuum. What with official smoke screens and plenty of civilian fog, it might be said we are experiencing the "daze phase" of a new war psychology.

I have tried to put together some stray fragments of the Old America I grew up in, browsing around in a groping muddle like we do when we pick up a jumbled set of mosaics to fit into a puzzle picture.

When I find that points don't match and corners don't fit like they always did before, my first impulse has been to say, "All bets are off because this is a war-time era, and old values and traditions belong in the bone-yard during this game of dominoes with destiny." But my other self won't accept such an excuse.

Some examples will show what a pother my addled mentality has experienced since December 7, 1941. Although I have been called a submerged genius, I am sure the thinking processes work in most of us along the same grooves, unless we have a military or bureaucratic viewpoint.

Perplexing contradictions like the following vex us in a democracy going through the daze phase:

The farmer feeds grain without a ceiling price to hogs on which there is no ceiling price, and maybe he averages $14.50 at the market, or five times the price ten years ago.

The meat trade packs and services

consumers, battles and bargains with union labor, and hardly squeezes through under a ceiling price on pork.

Consumers on the whole have much more cash to spend on victuals, and yet they voice raucous indignation aimed at every element engaged in the meat business, from farrowing pen to retail counter.

The farmer uses family labor early and late, loses trusted help to competing government war plants at very critical harvest periods, and can't get the steel for machine replacement or the lumber to build winter storages.

The trend of wages for all labor, from deft artisans to lumbering wood butchers, is geared upward in a spiral powered by the relentless dynamos of defense production.

Boys and girls who normally go to Pa for their spending money or earn a little at odd jobs in vacation are thrust into factories and offices, where they often earn more than dear old Dad ever did. (Some such bonanza bubbles may burst in time, leaving disillusioned youth to an ordinary beginner's income, likely to be an insult to them for the moment.)

THEN I listen to a farm organization's talented Washington scout and lobbyist tell his followers that "consumers of America have been spoiled with cheap food."

On the return trip I ride with a railway conductor who says the greatest enemy of the American masses earning their bread is "the selfish and greedy agricultural agitators."

Despite the claims of the farm lobbyist, I read reports of undernourishment still among us, as shown by rejected draftees from crowded cities suffering from traces of rickets, anemia, poor teeth, and bad digestion.

In contradiction to the critical conductor, I know thousands of calm, humane, self-sacrificing farm folks who never argue over long about their share of the national wealth or the attainment of the "parity" Utopia.

I see the legions of 4-H clubs and other youth movements clinging fast to the "four freedoms" they know best—of head, heart, hands, and health.

In the same towns I see youthful sailors on "shore leave" often taking personal liberties and parading with silly young giddies beyond the limits normal society grants to guys who wear civilian clothes or overalls. But it is not considered right to chide their folly because they have become symbols of an American dream answering the drum.

In taking subscriptions for victory bonds, I receive stamps and pennies from the blistered palms of young girls delving in war plants, signing up for the bond issue jointly with a sweetheart in the ranks.

Then I read Congressional reports reeking with the scandals of contracting agents nabbing fat fees for shaking down the plum tree.

Out of this daze of good and bad, of affirmative and negative, one emerges groggy and bewildered. Here is our big danger point. We can't sit down and see injustice done or the scales unfairly balanced; but in working on through this first phase of dilemma much depends on just keeping our shirts on.

We are only human, even though geared to a mad machine eruption. The warp and woof of our old American fabric has always presented its lights and shades, its frayed spots and snarls, along with its strength and character.

YOU can dip back into almost any critical rush period of our history and find disagreement, argument, selfishness, class prejudice, and chaos, coming to the surface or hidden beneath.

You and I recall incidents related in our youthful school days about the raw treatment accorded to statesmen we since revered, like Washington, Jefferson, and Lincoln; financial scandals in high places; jealousy among generals; secret pacts; treachery and deceit—but

it all finally got straightened out and the sun shone again on a republic recovered from its bacterial fever.

Even yet they among the teaching profession sometimes debate about the way history books are written—some liking them polished up and starry with glory, and others enjoying some choice and frank de-bunking. There is always room for anything you want to find when human nature gets on a rampage. But let's wait until the time

comes when we can stand back from the canvas of our era and get a good, true perspective of it.

If we listen to mean gossip and buck-passing all the time and never rouse ourselves into doing something active, we'll get to be like a man with a microscope—no perspective, but a darn lot of dirt in one fly-speck.

Getting down to specific details and taking up a field best known to us, I'd like to mention the recent flurry and furore set going amidst our organized farm phalanx by current war-time problems.

We all know that farm organizations are composed of human beings with all their acquired and inherited preferences and prejudices. In times like these we must try to be patient and overlook small foibles unless their existence tends to interfere with the larger and broader objective of the Nation in a crisis.

Likewise we know that groups within these same organizations have held varied viewpoints on basic social subjects of our times. For instance numbers of our good leaders and followers have decried the "spoon-feeding and babying" of the so-called sub-marginal rural populace.

Much of their dislike to such practices and the use of public funds for rejuvenation and loans is traced to sectional outlooks in part, and also to the inherent tradition of rural America to insist on self-reliance and hard labor as the pathway to agricultural independence. It is true that exponents of this rock-ribbed conservatism have maybe forgotten that a good man may fail on poor land during adverse financial periods, and that all the sub-marginal sheep are not "goats."

During the recent depression the conservative farmers looked askance at the government aid to submerged groups, but tolerated it in a way because they had some taste of adversity themselves.

But when the fulness of the financial boom arrived and prices became more promising to agriculture in general, the conservatives held to the doctrine that it is folly to give further paternal assistance to weaklings, arguing from many ample proofs that such farms seldom contribute over much to the war-time goal of food and fiber. That is, their thesis was that the poorer farmers did well to eke out a subsistence unaided, and not much more with loans to boot. Some even went so far as to exclaim that "all the money granted to such farmers would more than pay for all the production they ever contributed."

It was then that the other vocal group among our organized farmers took up the cudgel in behalf of the less fortunate brethren. Their answer was that the conservatives in this case were the radicals in former times, who sought all kinds of public aid and subsidy, providing the bread was buttered on the upper crust.

And so the fight went on, even into Congress and beyond into small meetings everywhere. Charges and countercharges flew thick and fast, which to our way of thinking proved nothing and gained little—except to divide the

(*Turn to page* 44)

Clifton Smith Succeeds On Worn-out Farm

By L. R. Combs

Soil Conservation Service, Milwaukee, Wisconsin

ON a cold, raw, windy day in January 1936, Clifton Smith moved 30 miles to a farm 3 miles northwest of Eagleville in Harrison County, Missouri. Clifton and his brother alternated in driving the old Model-T coupe and the team hitched to a wagon-load of furniture and farm equipment. The driver of the Model-T would stop every few miles at a filling station and wait to exchange places with the driver of the team. Mrs. Smith and two small daughters rode in the coupe.

As they neared the farm, cold and somewhat discouraged over things in general, Mr. Smith told a filling station operator, who was well acquainted with Harrison County land, the name of the farm to which they were moving.

"You've got the poorest gol-darned farm in Harrison County," the station operator said with brutal frankness.

That was the Smiths' introduction to their new home.

But the Smiths weren't downhearted for long. They had bought the 120-acre farm for $3,500, nothing down, and with the understanding that they need pay nothing on the principal for five years. The land had been foreclosed by a bank because the previous owner had been unable to pay off the mortgage.

Today things are looking brighter for the Smiths, and the farm is a better farm. Back of this brighter outlook is a story of the reclamation of a worn-out Missouri farm, a story of careful planning, of hardship, and of self-denial.

For four years the Smiths did without a car. They raised a large garden, watering tomatoes and other essential crops to produce the bulk of their own food when many gardens were killed by drought. Mrs. Smith canned garden products. Home-butchered hogs provided meat, and the White Leghorn flock provided eggs. Mr. Smith gradually increased his cattle, hogs, and sheep, improved his pastures, protected his land from erosion, rebuilt fertility, and put what money he could get his hands on into the land. The first year the Smiths made only a living and enough to pay taxes; they borrowed to pay the interest.

"I had to figure twice a good many times before I spent some of the money I did," he says. "In fact, I spent a little when I didn't know where the cash was going to come from. But it paid."

Mr. Smith inspects lespedeza after period of severe drought and heat. Bluegrass was gone, ground was cracked, but the lespedeza was green and furnishing good pasture.

Evidence that it did pay is found not only in the appearance and productivity of the land, but also in the cold, black-and-white figures in the bank and finance company records. (Since buying the farm, Smith has refinanced the debt, giving a mortgage as security to a local trust company.)

Five years after he bought the farm, Smith had paid off $1,100 of the debt, had increased the number of livestock, had a two-year-old, second-hand car paid for, and had bought some farm equipment. At this rate he will have the farm paid for in another five years. On a farm that wouldn't make a living let alone pay for itself before, that is a record of which the Smiths can be proud.

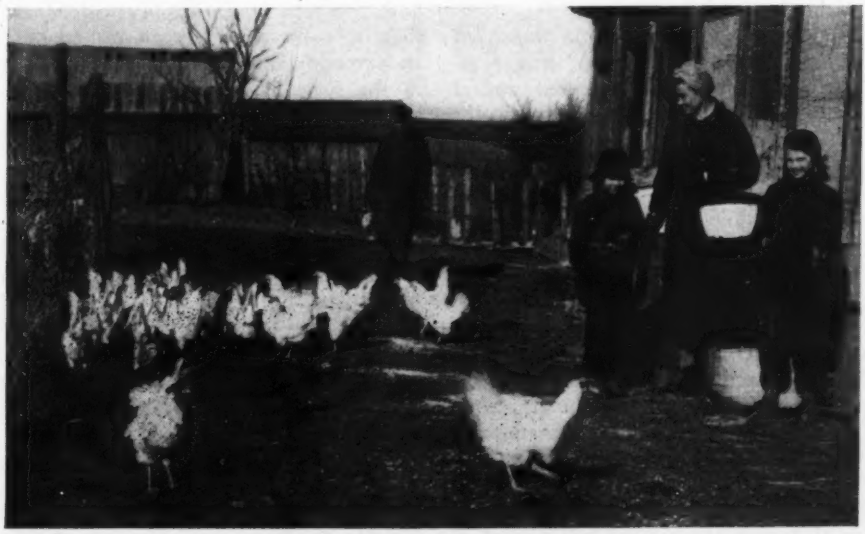
The how and why is a long story, but here it is in brief.

When Smith came to the farm, 37 of the 120 acres had been in corn and 5 acres in soybeans. Seventy-one acres were in meadow, but most of those acres were so weedy that a self-respecting cow would go on a sit-down strike. Overgrazed, gullied, and weedy, they marked a farm on the verge of abandonment. The usual patch-work of square fields with up-and-down hill rows confronted the new owner. Some of the fields had been in corn when nature never intended them to produce anything but grass.

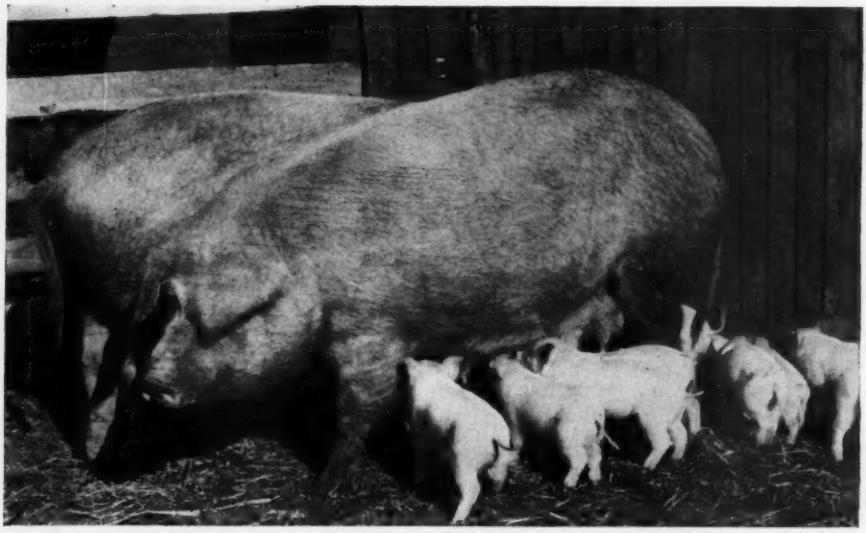
Mr. Smith immediately began to change this condition. He developed a farm plan which by 1938 had reduced the corn acreage to 12. That same year he had 28 acres of oats and 16 acres of mixed grass-legume meadows on his 56 acres of cropland. Another 49 acres were in permanent pasture and 4 acres were in alfalfa. Two acres of wildlife cover surrounded a couple of ponds which had been constructed to check large gully heads and to furnish a water supply for livestock. Feedlots, buildings, and lanes took up the other 9 acres.

Terraces protect all 56 acres of cropland. Smith uses a rotation of one year corn, one year oats seeded to legumes and grasses, and one year of grass-legume meadow which, considering the fact that his land is protected by terraces and contour tillage, is a safe rotation. He planned to have no corn in 1942, however, and was shifting to a small grain, grass, and clover rotation.

The terrace system was laid out and partly built by the Soil Conservation



Part of the White Leghorn flock which is helping the Clifton Smiths pay for their farm. Mr. Smith is in the background and at right are Donna, Mrs. Smith and Dixie.



None can say this sow with her nine pigs isn't helping produce food for freedom—not to mention helping pay for the farm.

Service demonstration project at Bethany and was completed by Mr. Smith with a six-foot blade and four horses. He plans to construct some more terraces to protect more of his land.

One of the first things Mr. Smith did was to divide a 40-acre bluegrass pasture into two equal fields, improve the pasture, and start rotation grazing. Water is piped from a pond to a tank on the fence line to provide water for stock in either pasture. A similar arrangement at the other pond and a well at the barn enable him to water livestock in any field on the farm which he may have occasion to pasture.

To supplement his bluegrass, he started liming, fertilizing, and manuring as rapidly as possible in order to establish pastures of sweet clover, timothy, and lespedeza or small grain and lespedeza. One hundred and eighty-six tons of lime have been applied to about 60 acres, 20 per cent superphosphate has been applied ahead of the small grain crops, and all manure is returned to the land. In fact, Mr. Smith locates his hay and straw stacks on or near the thin spots in his fields so this land can get the full benefit of the feeding operations.

One field was so badly gullied that farm machinery couldn't cross it. Terracing and seeding part of the field to pasture are enabling the gullies to heal so that now only scars of the original gashes can be seen.

Evidence of the success of his pasture program—which he says is the key to "what little success" he modestly admits he has made—is also found in the fact that he won first place in his county and second place in the north district in the Missouri pasture improvement contest in 1939. Winners of the contest are chosen not only on the basis of pasture production alone, but also on the basis of management and use of pastures for livestock production, balance between pastures and other crops, the general quality of the farm management plan, and other related activities.

A 20-acre "weed field," a so-called pasture which had been overgrazed and neglected, was treated with lime and manure and seeded to sweet clover, timothy, and lespedeza. Later 20 per cent superphosphate was applied at the rate of 150 pounds per acre and the field sown to oats and seeded to a grass-legume mixture. This was one of the fields drawing considerable comment

These cows, some Angus cattle, hogs, chickens, sheep, a prize-winning pasture renovation program, and soil conservation practices are helping the Smiths "make a go of it."

the year Smith won the pasture contest.

Mr. Smith harvested 2 crops of hay and nearly 7 bushels of alfalfa seed from a 7-acre field of alfalfa in 1941, a year which was not a good alfalfa seed year and when it was worth $12 to $15 a bushel. He always plans to seed winter rye in his lespedeza in the fall, not only to provide much-needed early spring pasture but to give additional protection from erosion during the winter when the annual lespedeza dies out.

When Smith came to the farm he had 3 cows and some calves, 4 horses, a couple of sows, and a few ewes. He now has 9 Angus cows, 5 of which are purebreds, 4 mixed Jersey and Guernsey cows, 30 ewes, and 4 sows with pigs. During the last 5 years he has sold $650 worth of mule and horse colts. His pig crops the past 2 years have averaged 7 pigs or better per sow.

Next year he plans to keep six sows. The flock of White Leghorns is being increased from about 150 to 200. These increases, in addition to increased milk production from improved feeding and possibly increased numbers of stock, will be the Smiths' contribution to the Food for Victory program. Not a large increase in itself, but it and hundreds of thousands like it will help produce the food that the nations fighting dictator aggression will need to win the war.

And as Smith pointed out, his conservation practices are enabling him to increase production on a farm which otherwise might be entirely out of production. This production will come not at the cost of wasted topsoil or decreased fertility but as a result of soil-saving methods and improved soil productivity with no increase in grain acreage. There's no question, he says, but that conservation practices enable the average farmer to produce more from fewer acres, while at the same time protecting his soil from erosion and improving fertility.

Last fall Smith rented a 20-acre stock and grass field for pasture, and he operates about 40 acres on the farm of his father-in- law, J. W. Craig. On that land he also applies soil conservation practices, following a rotation designed to check erosion and maintain fertility.

The work of building a new farm home on a foundation of rundown soil

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Conserve Nitrogen Now

By F. G. Merkle

Pennsylvania State College, State College, Pennsylvania

NITROGEN is a peculiar element. It is the characteristic chemical element in the proteins which are the "preeminent" constituents of living cells. It is important, therefore, in giving life to all living things. But, paradoxically, it is a basic constituent of explosives which are important in giving death to living things. Hence, at this time there is a double demand for nitrogen, that is, for growing crops and for munitions. The latter is so great that we are now threatened with a shortage of fixed nitrogen.

Nitrogenous fertilizers were among the first fertilizers used in addition to animal manures. Their use has become almost imperative for many types of crop production, because our agricultural methods allow losses to occur which never took place under natural conditions. In the native forest which covered the soils of eastern United States, the trees and shrubs assimilated from 50 to 100 pounds of nitrogen from the soil per acre per year. This was the most readily available nitrogen Very little nitrogen was lost by leaching because the roots of perennials were alive in the soil at all times. Nearly all the nitrogen taken up by the trees and shrubs was returned to the soil sooner or later in the fall of leaves and finally the entire tree. Neither was there much loss by erosion under these conditions. Cultivated crops do not require more nitrogen than the native vegetation did, but in the way we grow them, the losses are much greater.

Most Eastern soils contain from 1,500 to 3,000 pounds of total nitrogen which is chiefly in the surface soil. A small portion of this becomes available yearly. This small amount is either taken up by the crops planted or it is lost by leaching. If taken up by the crops, it may be removed far from its original soil. In addition, the accelerated erosion which takes place on cropped land may remove as much as the crops remove. In these crops the most available portion of the 1,500 to 3,000 pounds of total nitrogen in the soil is gradually depleted. Replenishing with fertilizer nitrogen becomes essential because year by year the most readily available soil nitrogen is removed far from the soil in which it originally existed.

In general, those types of agriculture which most nearly resemble natural conditions are the least likely to need fertilizer nitrogen. Of all types of farming, dairying is perhaps most nearly like natural forest, because the dairy cow consumes her food either in the pasture or in the barn. In the first case, the excrements are returned directly to the soil with little loss. In case she is fed in the barn, the manure is presumably returned with some loss.

Plant-food Removal

In the production of vegetables, tobacco, cotton, or any crop which is sold from the farm, there is little or no prospect of returning the nitrogen it contained to the soil from which it came. This may mean the yearly removal of from 50 to 150 pounds of the best nitrogen that the soil contained. This cannot continue long.

In addition to the above, losses by leaching and erosion take place in considerable amounts when soil is cultivated. During the fall, winter, and spring when the corn and potato lands are bare, leaching may remove almost enough soluble, available nitrogen to grow an ordinary crop. Erosion, likewise, may be considerable during the spring months on poorly covered land.

It seems, therefore, that while the present shortage of nitrogen exists, the producers of vegetable crops, both those grown intensively and extensively, should receive first consideration in the rationing of nitrogen, whether the rationing be voluntary or compulsory. This is so, because a good supply of available nitrogen is essential for the production of nutritious, palatable vegetables and truck crops. Furthermore, these growers have less opportunity to make use of legume and animal manures. Fertilizer nitrogen is likewise essential in tobacco production and in tree and small fruit production. Generally, these producers have little or no manure and are producing a crop which is much benefited by available nitrogen. Economic production of these crops demands fertilizer nitrogen.

Meeting the Emergency

The general dairy and grain farmer is much less dependent upon nitrogenous fertilizers. In normal times, when nitrogen is cheap and plentiful, he may use it and should do so if needed. But, in the present emergency, he may dispense with fertilizer nitrogen for a few years at least.

When there is plenty of anything, we are prone to obtain it the easiest way, to use it extravagantly, and even to waste it. However, when a shortage arises, our attention is attracted to conserving what we have. "A penny saved is a penny earned." While it is well known that leguminous crops fix atmospheric nitrogen in sufficient quantity to feed themselves and some of the crops which follow them, it is true that if the legume program is not already in progress on a given soil, it may take a year or two to whip it into shape so that it will begin to supply our needs. We need the nitrogen now for next year's crop. Therefore, we must first turn our attention to conserving and using supplies at hand and, in the meantime, institute a program of legume fixation.

The amount of highly available good quality nitrogen wasted in Northeastern agriculture is tremendous. It is safe to estimate that two or three times as much highly available nitrogen is lost in handling manure as is contained in all purchased fertilizers. If this loss could be reduced to one-half its present amount, the nitrogen shortage problem would be solved at once.

Nitrogen may be lost from manures through fermentation in the gaseous form, as ammonia, and in the liquid form, as soluble compounds consisting of nitrate, ammonia, and soluble organic nitrogen. The greater loss, and the one most feasible to control, is the loss in the liquid form in leaching. If one makes it a point to examine every stable and barnyard as he tours cross country, he will observe that a large percentage of them are so arranged that loss of liquid manures is considerable. These liquids contain over half the total nitrogen excreted by the animal and the nitrogen they contain is over twice as active as that contained in the solid excrements. Urine may be lost in poorly constructed stables with leaky floors, particularly when insufficient bedding is used.

Additional losses occur if manure is piled on a sloping surface near the barn. The pressure produced when manure is piled in high piles squeezes much of the liquid portion out so that, even though the loose bedding appears to absorb considerable liquid, it may be lost later when piled under pressure. Many barnyard walls are little better than sieves which hold the solids and allow the valuable liquids to leak through.

To Reduce Losses

The measures which suggest themselves to reduce these losses are: First, the use of ample absorbent and the transferring of the manure in the loose condition directly to the field before the juice is squeezed out; second, if it must be stored for periods, it will pay well to construct a water-tight concrete pit having both sides and bottom completely waterproofed. The loss of nitrogen in

the gaseous form, as ammonia, is probably not nearly as great as the loss through leaching, and it is not as easily controlled. Loss of ammonia gas may take place in the stable, in the storage pile, or in the field. The use of superphosphate in the gutters helps reduce this loss by converting the ammonia to a non-volatile compound. One or two pounds of superphosphate per cow per day, scattered in the gutters, is a customary quantity.

In Terms of Dollars

Pennsylvania farmers have in past years used over 8,000 tons of fertilizer nitrogen yearly for which they paid over two million dollars. Big as this figure is, the nitrogen losses in handling manure are easily two or three times as great. And, with a little care, the losses in nitrogen may easily be cut in half. Here indeed we have a supply of "scrap" nitrogen for the emergency, "scrap" of A-1 quality.

Another instance in which high quality nitrogen is wasted is in leaching from soils. Each year, during the winter and spring, a considerable proportion of the melted snows and the rains filters through the soil, finding its way into the ground waters. Any nitrates left in the soil at the close of the growing season may be completely removed by the percolating waters. Analyses show that soils contain little or no nitrate nitrogen in the early spring. It has been washed out. The amount so lost is very considerable and is of high quality.

Research has shown that land left bare during the leaching months may lose enough nitrate to grow an ordinary crop. It also has shown that when soil is growing fibrous-rooted, sod-forming crops, there is almost no loss of nitrogen by leaching. This information suggests the value of cover cropping cultivated lands during those periods when it would otherwise be bare. At the close of the growing season, after harvesting such crops as corn, potatoes, tobacco, and most vegetables, there remains in the soil more or less unused nitrate and more nitrate continues to be produced by bacterial action during the fall months. This nitrate is quite certain to be leached out during the winter unless it is taken up by some crop.

A cover crop planted, either while the main crop is still occupying the land, or as soon as possible after harvesting, will quickly take up this nitrate and build it into plant protein which will be released the next spring when this cover crop is plowed under and decays. Rye grass or meadow fescue may be planted in the standing corn at the last cultivation. Rye or rye and vetch may be planted immediately after digging potatoes. Rye grass, meadow fescue, and, in some cases, crimson clover may be satisfactorily used as cover crops in vegetable production. These may be sown even before the vegetables have been harvested, after the chief growing season has passed.

It may be roughly assumed that a good stand of cover crop will assimilate possibly 20 to 40 pounds of nitrogen before it is plowed under the following spring. This nitrogen would be lost were the cover crop not grown. Of course, the cover crop will perform other benefits besides simply controlling nitrate loss; it will add organic matter, improve the soil physically, and control erosion.

Checking Erosion

Erosion, which likewise takes its greatest toll when the soil is bare or in row crops, is another loss which can be reduced considerably by cover cropping. While the nitrogen lost by leaching of manure or leaching from soil is of the highest quality, a good portion of the nitrogen lost by erosion is crude organic nitrogen. Possibly 20 to 120 pounds of total nitrogen may be lost in a single year by erosion from bare soil, small grains, or row crops.

Preventing or decreasing the losses described above seems to be the most

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Fertility Program Makes a Wheat King

By C. E. Skiver

Agricultural Experiment Station, Purdue University, Lafayette, Indiana

Herb Johnson, Ft. Branch, Indiana, 1942 champion wheat grower of the State, used 0-20-20 fertilizer.

FOR the past three years southwestern Indiana's Pocket Area has picked a wheat king on the basis of a score card which emphasizes soil management and fertility practices, as well as wheat production. In this new "show window" for corps, fields are judged by committees of farmers using a carefully prepared score card where plenty of stress is placed upon the crop history and treatment of the field.

This year the honors went to Herb Johnson of Gibson county on his 10 acres of Rudy wheat and the practices that he used to grow it. The Johnson farm lies on the edge of the "Mash" which is the local expression for what was formerly a marsh. The lands of this area were extremely fertile, and crop production was good for the first 50 years of farming.

But starting in 1914 Herb noticed that his yields were not holding up, and he began to search for the best known methods of preserving his greatest natural resource, his soil fertility. His first thought was that he should improve his soil-building crops, and so he started a liming program which he completed in the course of nine years. This he noticed improved his clover stands as well as their growth and materially increased the return of valuable humus to his fields.

With his lime content up and his nitrogen supply on the gain, Mr. Johnson was quick to see that the mineral reserve of his soil was rapidly being depleted. He naturally reasoned that the only way to replenish this was through the purchase of these elements in the form of commercial fertilizer. To his rotation of corn, wheat, and clover Mr. Johnson has applied liberal applications of 0-20-20 to his wheat and 0-12-12 in the row for the corn. Through the past 18 years this program of liming, returning a generous supply of good humus, and supplementally feeding his rotation with minerals has made the Johnson farm one of the outstanding producers in the area.

Coupled with this program of retaining a reservoir of fertility have been good production practices. Several years ago Johnson adopted Rudy as the variety of wheat that would best trans-

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This picture shows what a proper application of borax did for crimson clover.

The Southeast Can Grow Clover and Alfalfa

By L. O. Brackeen

Agricultural Experiment Station, Auburn, Alabama

DR. J. A. NAFTEL, soil chemist, believes that officials of the Alabama Experiment Station may have found a solution to maintaining stands of crimson clover and alfalfa and to producing seed of these crops on coastal plain soils where they have not been successfully produced in the past. For several years the Station has grown crimson clover on sandy soil in greenhouse experiments by applying 15 to 20 pounds of borax per acre in addition to the lime, phosphate, and potash ordinarily used. Excellent results were obtained in field tests in 1941-42.

"Our investigation indicates that the practical application of fertilizer containing small amounts of boron may be necessary for the successful growth of crimson clover and alfalfa on soils of the lower coastal plains and other soils low in boron," he says. "We definitely know that the proper amount of borax per acre will prevent alfalfa yellows and will increase the production and improve the quality of several root crops, especially turnips and beets.

"It has been our observation that crimson clover and alfalfa made good yields where blast furnace slag was the source of lime. When boron was applied to other sources of lime, similar favorable response was obtained.

"Our results not only showed that the growth of crimson clover and alfalfa was successful in vegetative yields, but also pointed to the possibility of producing home-grown seed. Each of these factors is vitally important in the establishment of successful legume programs in the Southeast."

Early attempts to grow crimson clover and alfalfa on sandy soils of the coastal plains area have showed that, although satisfactory germination of the seed was obtained, in many instances the seedlings died at an early stage. Examination of the roots of the seedlings showed darkening of the conducting tissue and retarded de-

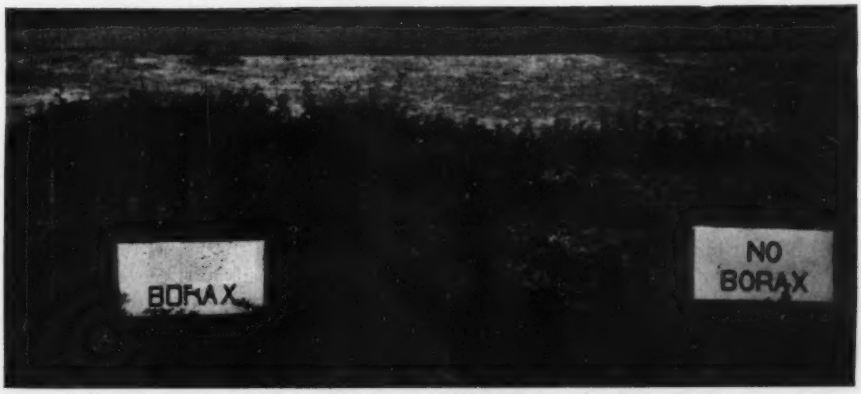
Same experiment as pictured at the left except this clover received no borax.

velopment of roots as compared with healthy, vigorous roots on seedlings where boron was applied. Seedlings that survived on boron-deficient soils showed deficiency symptoms. Although seeds were inoculated with commercial legume cultures, few or no nodules developed on the winter legume plants on boron-deficient soils.

It appears from the results of our investigation that crimson clover and alfalfa require the addition of small amounts of boron for normal growth on some soils," says Dr. Naftel. "Many of the soils of the coastal plains are extremely low in boron and where lime is applied, the need for boron by leguminous and other crops is increased. It is entirely possible that some failures on soils low in available boron content have been due to a deficiency of this essential element."

Dr. Naftel recently made a trip through Tennessee in which he observed some 30 of the 300 alfalfa demonstrations in that State. The contrast between those treated with boron and those untreated was very noticeable with the areas receiving borax showing very little, if any, sign of alfalfa yellows.

The Tennessee results on alfalfa have been so striking that H. E. Hendricks now recommends that every acre of alfalfa seeded should have an application of from 20 to 30 pounds of borax per acre applied either at the time of seeding or by April 1 of the



Results on alfalfa were also striking. The alfalfa left got borax; right, none.

following year. This will prevent alfalfa yellows, increase the yield and quality of hay, and lengthen the life of the stand.

Borax applied at the rate of 15 pounds per acre on Cecil sandy loam in North Carolina resulted in an increase in yield of alfalfa from 289 to 743 pounds per acre. The application of borax resulted in the production of 82 to 184 pounds of seed per acre; whereas, the plants on the plots receiving no borax failed to set any seed.

Similar results have been obtained by the Virginia Experiment Station. "Applications of 10 to 15 pounds of borax to the acre on boron-deficient soil will greatly increase the yield of alfalfa hay and also stimulate alfalfa seed production as well as increase the thickness and duration of the stand," concludes T. B. Hutcheson, station agronomist.

At the Sand Mountain Experiment Station in North Alabama, it has been found that alfalfa yellows can be controlled by the use of 20 pounds of borax per acre. Many farmers in that area are now planning to make considerable increase in their alfalfa acreage this year.

How to Apply

Relative to the methods of applying borax to crimson clover and alfalfa, Dr. Naftel says that on new seedings the borax should be applied along with the lime, phosphate, and potash. On established fields the borax may be applied any time of the year, either in the fall or after any cutting, with a cyclone seeder or by hand. He also calls attention to the fact that the State Department of Agriculture has recently authorized fertilizer manufacturers to produce and distribute a 0-14-10 and that some manufacturers are now planning to include borax. Such fertilizer will be referred to as a special fertilizer for alfalfa and crimson clover.

Dr. Anna L. Sommer, soil chemist of the Alabama Experiment Station, has found that many Alabama soils are deficient in boron, a necessary plant food just as nitrogen, phosphate, and potash. Sandy soils are usually much more deficient in boron than other types. The two main causes of this deficiency seem to be not enough actually in the soil to begin with, or an overliming of the soil, which makes the boron present unavailable. Some of the vegetable crops that have been tested at the station are turnips, cabbage, tomatoes, Irish potatoes, and beets. Of these crops, beets and turnips seem to respond more readily to boron.

Work by Dr. L. M. Ware on boron deficiencies shows that 10 pounds of borax applied to an acre of sandy soil or 15 to 20 pounds on medium to heavy soil are sufficient for turnips and beets. He also has found that basic slag applied to land will partly overcome the boron deficiency, also that irrigation and plenty of organic matter reduces the need for boron.

Field Observation

Will Howard Smith, master farmer and successful truck crop producer, Prattville, Alabama, prevents brown heart in turnips by applying 10 pounds of borax per acre along with the other fertilizer at planting time.

"Briefly, we make a practice of using 10 pounds of borax per acre annually under our 300 to 350 acres of turnips, mustard, and collards," says H. Owen Murfee, Jr., general manager of Mr. Smith's farm. "From a field observation, these crops yield about 10 to 25 per cent more and have an improvement in quality of 25 to 100 per cent, especially the roots of the turnips. When we do not use borax, 75 to 100 per cent of our rooted turnips develop black hearts before they mature. By using borax, we have practically eliminated this in our turnips.

"In regard to other crops Mr. Smith ran some tests on vetch last year on sandy soils and the borax increased the vetch yield easily 25 per cent. This year we are applying 10 pounds of borax per acre under each of our 1,000 acres of sandy land vetch. We also are running a few tests on crimson clover,

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This tractor, with wind-rower attachment, was in operation during the Field Day.

Ladino Field Day

By J. D. Hutchison

County Agent, Luzerne County, Wilkes-Barre, Pennsylvania

FIVE years ago there was not an acre of Ladino clover on farms in Luzerne County, Pennsylvania, but today there are in the neighborhood of 1,500 acres of this new and profitable crop being grown. In order to convince farmers from Luzerne County and the adjoining northeastern counties of Pennsylvania of the value of this crop, a Field Day was held at the Andrew J. Sordoni Sterling Farms on June 3. Despite the gas and rubber situation, more than 400 farmers and their wives attended to make their own observations on this "new" clover and to learn more about its possibilities.

The Sterling Farms were purchased by Andrew J. Sordoni in 1937. They were typically rolling, stony, Volusia type of clay loam, and had been in the hands of the Stull Estate for a great many years. The fields had had no treatment for the past 15 years, having been laid down in timothy. Annual applications of nitrate of soda were made, and as a result they had become timothy poor. A sprinkling of timothy, five finger, paint brush, the roving wild strawberry, and hummocks of moss comprised the main plant population.

The first field to be observed on the trip was a permanent pasture consisting of 29 acres that since May 1 had been carrying 60 head of Guernseys. This permanent pasture had been renovated in the following manner. In 1938 one pound per acre of wild white clover was sown. No other grass or legume seed was added. The field was top-dressed with one ton of ground limestone, 300 pounds of 16% super-

phosphate, and five tons of manure. A similar application of manure was made in 1939. In 1940 the manure application was repeated, and one ton of ground limestone, and 400 pounds of an 0-24-12 per acre were applied. The treatment in 1941 was a late fall application of 300 pounds of an 0-20-20 fertilizer per acre. Other practices employed were harrowing each fall with Scotch chain harrow, clipping twice during the season, and use of a cultipacker in the spring.

Response to the above treatments was beyond all expectations. Kentucky bluegrass and the wild white clover came in abundance, and despite the early dry spring in 1942 it was necessary to clip this pasture with a mower before June 3 in order to keep the grass succulent and tender. In other words, 60 head of Guernseys could not keep down the grass.

The next field to be observed was the Ladino field, adjacent to the improved pasture. This field consisted of 20 acres which had been in timothy for a number of years. The subsequent treatment was as follows: the field was in silage corn from 1937 to 1939, inclusive, and received one ton of ground limestone and 10 tons of manure each year. In addition to the above, the corn received 300 pounds of 4-8-8 in 1937 and in both 1938 and 1939, 300 pounds of a 3-12-6 fertilizer per acre. Twenty pounds per acre of domestic rye grass were broadcast at last cultivation of the corn in 1939. In the spring of 1940 the rye grass was plowed in early spring, one ton of ground limestone and 400 pounds of a 3-12-6 fertilizer were applied and a grass-legume mixture composed of 15 pounds of alfalfa, 5 pounds medium red clover, 5 pounds timothy, and 2 pounds Ladino clover was seeded with 2 bushels of oats as a nurse crop. The oat crop was harvested in the milk stage and used for grass silage.

Results of the 1941 production on the above field are clearly revealed in the table below.

	Green hay tons per acre	Dried hay tons per acre	Approximate protein content
1st Cutting—June 11	12.5	3.75	17%
2nd Cutting—July 29	11.5	3.1	19%
3rd Cutting—Aug. 18	7.8	1.4	24%
4th Cutting—Sept. 12	4.5	.8	30%
	36.3 T	9.05 T	

During the Field Day on June 3 of this year a 3′ x 3′ area was harvested and weighed, and it was estimated that this particular cutting produced 15 tons of green hay per acre.

The first cuttings on all the Ladino fields at Sterling Farms are harvested in early June and the crop is ensiled. Seventy-five pounds of molasses per ton are mixed with the chopped material as it goes into the silo. The remaining cuttings, which are higher in protein, are usually made into high quality hay.

On the Sordoni Farm more than 150 acres of Ladino have been seeded, mostly into the Triple-Purpose Mixture developed by Dr. Fred V. Grau of the Pennsylvania State College Agricultural Extension Department. This mixture consists of the following grasses:

Orchard Grass ..... 5 # per acre
Meadow Fescue (Fall or Alta Fescue) ..... 5 # per acre
Alfalfa ..... 5 # per acre
(Use 2 # Alsike if soil is unsuited for Alfalfa)
Red Clover ..... 3 # per acre
Ladino ..... 1 # per acre

The lime requirement for the above mixture should be brought up to 7 pH.

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Fig. 1. Typical procedure used by one-mule farmers to fertilize and plant cotton.

The One-Mule Farmer Needs a New Machine

By G. W. Giles and E. R. Collins [1]

North Carolina Agricultural Experiment Station, Raleigh, N. C.

THE picture at the top of this page, Fig. 1, illustrates what we mean when we say the Southern farmer is handicapped by the lack of suitable equipment. Looking from right to left, the first man is opening the row; the second distributing and mixing the fertilizer; the third and fourth men are throwing up a bed with a turning plow; the fifth man is using a leveling drag to knock off the top of the bed on two rows, and the sixth man is planting the seed.

This picture tells a story of large production costs, great labor and power requirements, and inefficient use of fertilizer. All of this is due to the fact that the equipment he is using is out-of-date. Some modifications are made in the procedure illustrated in Fig. 1 so that fewer trips are made per row, but still the one-mule Southern farmer is severely handicapped by the lack of more modern equipment.

The tractor equipment illustrated in Fig. 2 requires only one man to perform all operations in one trip. The two-mule machine shown in Fig. 3 also performs all of these operations in one trip per row. The tractor and the two-mule equipment, however, are too expensive for the one-mule farmer. In order to successfully compete with the modern equipment as used by the larger farmer, the one-mule farmer

[1] Agricultural Engineer and Extension Agronomist, respectively, of the North Carolina Agricultural Experiment Station and the North Carolina Extension Service.

Fig. 2. Proper fertilization and planting of cotton are accomplished in one trip by modern tractor equipment.

must be furnished with a machine that will lower his cost of production. Can it be done?

The method of placing the fertilizer has a marked effect on the number of seed germinating. The average results in North Carolina over a nine-year period show that 95 per cent of the seed germinated where the fertilizer was placed in bands to the side of the seed, 75 per cent where the fertilizer was mixed with the soil under the seed, and 62 per cent when the fertilizer was placed in a band under the seed. This indicates that a farmer will have one-fifth more seed germinating when the fertilizer is side-placed than when using the common practice of mixing the fertilizer with the soil under the seed. Considering that North Carolina planted 860,000 acres in 1942, approximately one-fifth of the seed saved would be a considerable item.

With cotton valued at seven cents per pound and 500 pounds of fertilizer valued at $5, the return per dollar spent for fertilizer was $6.10 where the fertilizer was placed in a band under the seed, $6.99 where the fertilizer was mixed with the soil under the seed, and $9.04 where the fertilizer was placed in bands 2½ inches to each side and slightly below the level of the seed.

It has been estimated that North Carolina uses approximately 167,000 tons of fertilizer on cotton. Valued at $20 a ton, this means the farmer outlay of slightly more than $3,340,000 for cotton fertilizer. The difference between $6.99 and $9.04 return per dollar spent for fertilizer by the two methods of placement means an increase to the farmers' income of $6,800,000 per year.

One of the peak labor loads on the farm is at the time of planting crops in the spring. Shortage of labor and equipment usually makes it necessary for the farmer to spread out his planting over a longer time than is desirable for the best stand and yield.

With the present one-mule farm equipment as shown in Fig. 1, it requires 5½ trips per row

Fig. 3. Proper fertilization and planting of cotton are accomplished in one trip by modern two-mule equipment.

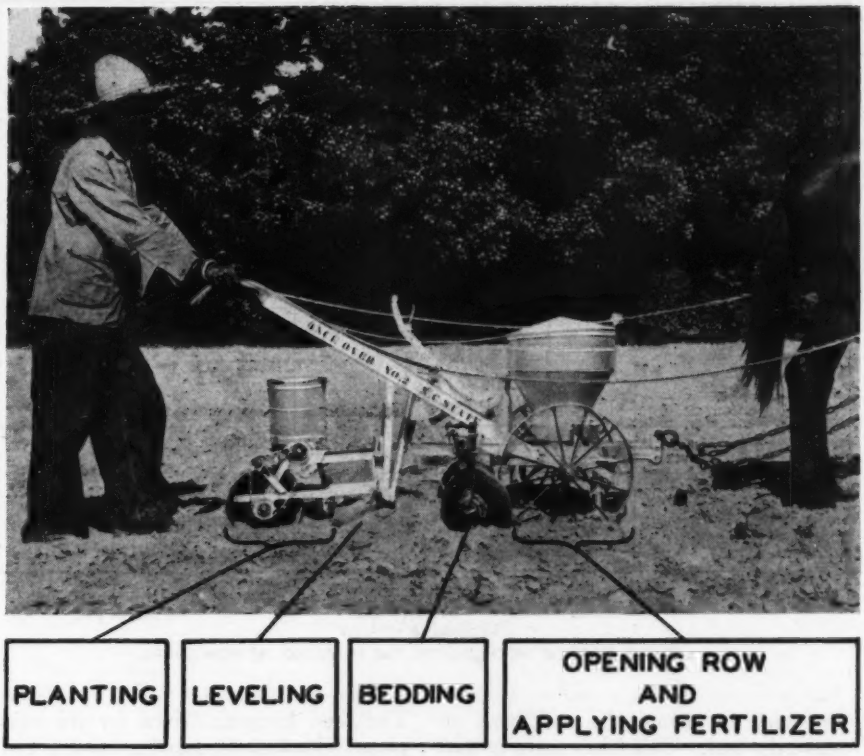


Fig. 4. One-mule, one-row, once-over distributor and seed planter accomplishes all operations in one trip.

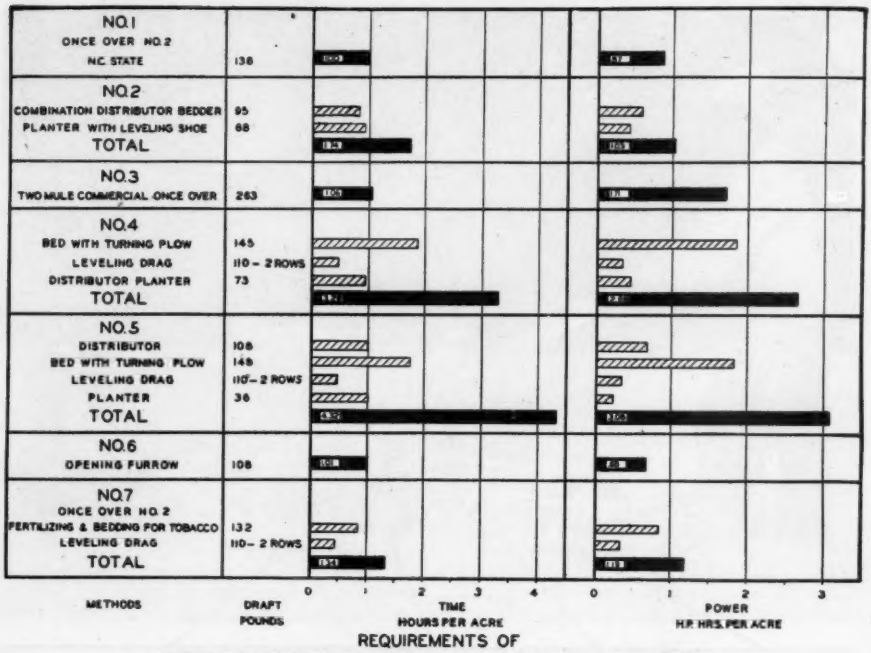
to plant the crops. Assuming 3½ foot rows, and the mule traveling at a speed of 2.4 miles per hour, one acre would be covered by each machine in approximately one hour. The practice shown in Fig. 1 would require 5½ man-hours per acre and 5½ mule-hours per acre. The modern two-mule riding distributor and planter shown in Fig. 2 would require one man-hour per acre and two mule-hours per acre.

For tobacco, sweet potatoes, and other transplanted crops, the common practice is about the same as for cotton, peanuts, and beans except the last machine operation of planting is omitted and the plants are set by hand. The conventional method for preparing the bed for these crops also requires excessive man-hours and mule-hours.

The average results on Coastal Plain soils for nine years show that fertilizer applied in bands under the seed produced 1,111 pounds of seed cotton per acre. Fertilizer mixed with the soil under the seed produced 1,174 pounds per acre and fertilizer placed on each side below the seed level produced 1,321 pounds per acre. This is an increase of 147 and 211 pounds, respectively, due to the methods of applying fertilizer.

Fig. 4 shows the one-mule, one-row, once-over machine which opens the furrows for the fertilizer, places the fertilizer in two bands, beds on the fertilizer, levels off the bed, and plants the seed with one trip to the row.

Two discs, adjustable to place the fertilizer in two bands from five to twelve inches apart, open the furrow for placing the fertilizer. The present practice of commercial machines is to throw the soil out, after which it is



REQUIREMENTS OF
VARIOUS MACHINE METHODS FOR THE PLANTING OF ROW CROPS

necessary to throw the soil back to make the bed. This takes extra power. One disc on this machine is set ahead of the other, thus making it possible to throw the dirt in without the difficulty of clogging from trash as would be the case with the present practice on commercial machines.

The bedding discs to complete the bed are adjustable in depth, width, and angularity so that it is possible to throw up any type of bed. Following the bedding discs is a leveling shoe which smooths off the bed to permit more uniform planting of the seed.

The planter is attached to the fertilizer distributor by an approximately vertical pin which permits the planter to move sideways independently of the distributor. Part of the load is carried on the rear press wheel in order to give a firm seed bed. The hinge point is midway between the distributor and planter so that in planting along terraces on the contour or going around a curve the seed are planted between the two bands of fertilizer. The seed hopper, driven by the rear press wheel, is a proven commercial type adapted to plant cotton, corn, peas, beans, peanuts, and other farm seed.

The machine has a lever for raising the discs out of the ground and stopping the fertilizer flow, making for easy transportation to and from the field and easy turning at the end of the row. The fertilizer distributor can be used separately from the planter by removing the pin of the hinge. The distributor used as a separate unit will place the fertilizer in two bands and throw up a bed desirable for transplanting crops such as tobacco and sweet potatoes.

Draft measurements and time measurements were made with an electric self-reading dynamometer and a stop watch on this machine and a number of commercial machines commonly used by farmers. The labor was expressed in hours per acre, as calculated from the draft and time measurements

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Fig. 5. Combination distributor and bedder used in Method No. 2. This applies the fertilizer, but does not plant the seed.

Fig. 6. Seed planter with leveling shoe used in Method No. 2 and used without the shoe in Method No. 5.

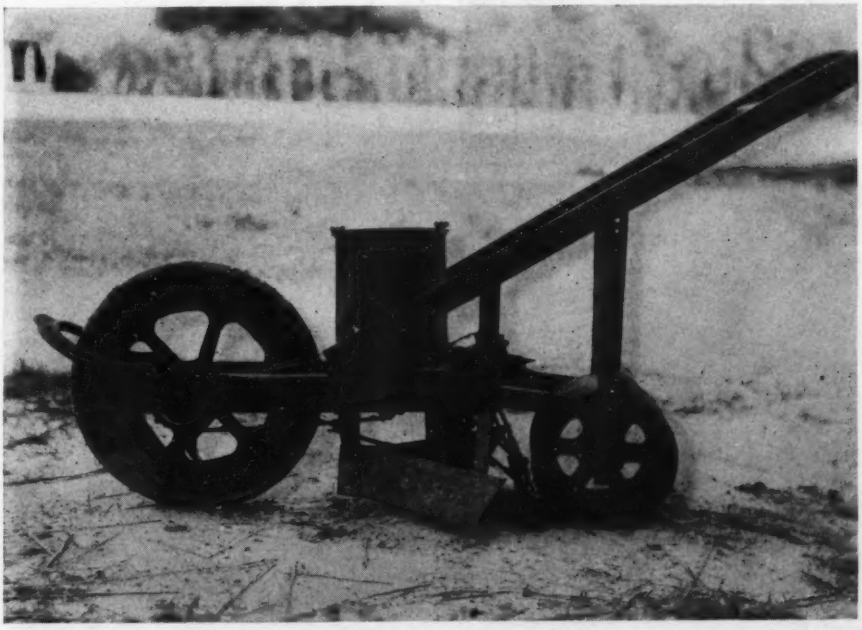


Fig. 7. (Above) Leveling drag used in Methods No. 4 and No. 5.

Fig. 8. (Left) Bedding with a turning plow used in Methods No. 4 and No. 5.

Fig. 9. (Below) Distributor and planter used in Method No. 4.

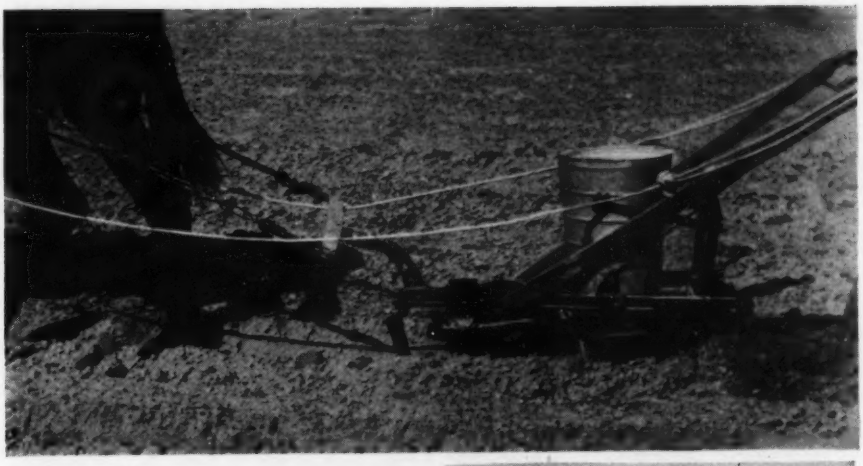
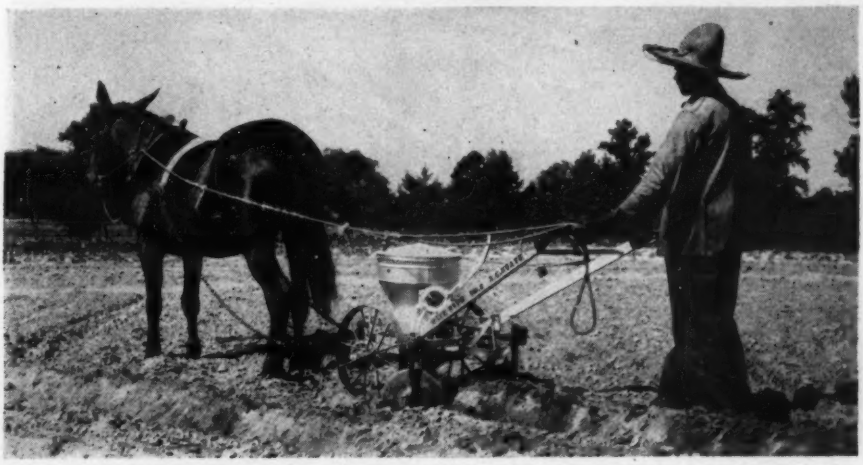


Fig. 10. (Above) Distributor used in Method No. 5.

Fig. 11. (Right) Dynamometer on plow for opening furrows—Method No. 6.

Fig. 12. (Below) Once-over No. 2 fertilizing and bedding for tobacco—Method No. 7.



Above—Illustrating how this side-placement distributor and planter could plant on a contour.

Below—Side-placing fertilizer and planting cotton with one trip to the row. Would this help solve the labor problem?

The Editors Talk

Growing Nitrogen

Like a pack of hounds in full voice after the disappearing fox, publicity on "growing your own nitrogen" to help tide over the shortage of nitrogen for agricultural use during the war period is in full hue and cry in the agricultural press. This is praiseworthy. Not only is the nitrogen-fixing ability of legumes being emphasized, but much of their very real value as soil conditioners and rebuilders is being brought out.

However, in some of this publicity it would seem that two important factors in the growing of nitrogen are being left out: First that it takes time and careful preparation to establish a good stand of nitrogen-fixing legumes; and second that such a stand must be amply fed with the mineral plant foods if the plants are to perform efficiently and at full capacity.

The first point is ably discussed in the article by Dr. F. G. Merkle of Pennsylvania State College appearing in this issue. Dr. Merkle's plea is to conserve now all the nitrogen available in animal manures, crop refuse, and the nitrogen to be lost through erosion and leaching if control measures are not taken; for if the legume program is not already in progress on a given soil, it may take a year or two to whip it into shape so that it will begin to supply our needs. He does not minimize the importance of growing legumes, but points out that as a quick emergency measure, conservation of all available nitrogen must be considered.

Attention to the omission of the second factor mentioned above centers in recently noting some releases from experiment stations which had been inadvertently "headlined" by the press to the effect that "Legumes May Have To Serve As Substitute For Fertilizer In War." Among the agricultural advisory groups it is so well known that nitrogen is the only plant food which legumes can add to the soil that it is scarcely necessary to take exception to such a statement as was "headlined." However, it is conceivable that some farmers not fully informed as to the importance of mineral plant foods might conclude that legumes will prove a cure-all for all their fertilization problems.

The mere growing of a legume will not necessarily produce the results desired in helping to solve the nitrogen problem. Legumes growing with unbalanced nutrients may not fix any nitrogen from the air. Dr. W. A. Albrecht of the Missouri College of Agriculture has shown that when these plants seriously lack calcium, phosphorus, potassium, and other nutrients, they do not fix nitrogen but actually behave much like non-legumes and at the end of the cropping period there may be less nitrogen in the crop than there was in the seed at planting time.

Other work has shown that the organisms in the nodules of legumes, which are really the means for fixing nitrogen from the air, function inefficiently or not

at all when proper mineral nutrients such as phosphorus, potassium, boron, magnesium, and calcium are not available.

Legumes are one of the greediest of all crops in their feeding upon the mineral plant foods. A 3-ton per acre crop of alfalfa will utilize 35 pounds of phosphoric acid and 135 pounds of potash; 5 tons of sweet clover, 45 pounds of P_2O_5 and 165 pounds of K_2O; 2 tons of red clover, 20 pounds of P_2O_5 and 70 pounds of K_2O; 3 tons of lespedeza, 30 pounds of P_2O_5 and 70 pounds of K_2O; 2 tons cow peas, 25 pounds P_2O_5 and 90 pounds K_2O; 25 bushels and 1¼ tons (straw) of soybeans, 40 pounds P_2O_5 and 60 pounds K_2O. Too often in the past this factor of proper mineral nutrition has been overlooked when growing legumes, with the probable result that frequently the nitrogen supply in the soil was not being augmented by the growing of a legume crop.

Under present conditions we cannot afford to risk valuable legume seed and cropping time by growing improperly fertilized legumes. In any program for the growing of nitrogen it, therefore, is expedient to carefully consider the mineral requirements of the crop and the soil's ability to meet these requirements. Fortunately there is a widespread use of soil tests. Fortunately again, there are adequate supplies of lime, borax, phosphoric acid, and potash.

Dr. Henry G. Knight

Announcement of the passing of Dr. Henry G. Knight, Chief of the Bureau of Agricultural Chemistry and Engineering in the U. S. Department of Agriculture, came too late for us to comment on this great loss to American agriculture in our last issue of BETTER CROPS WITH PLANT FOOD. Dr. Knight died in Washington on July 13 after a short illness. Many fine tributes were paid this eminent agricultural scientist and he and his work were well known to our readers. Yet, we feel it fitting at this late date to express our deep regret and sincere sense of loss to the agricultural research field in the passing of one who for so many years had stood out in his efforts for the betterment of agriculture.

Secretary of Agriculture Wickard said of Dr. Knight: "He has been an important factor in the development of scientific agriculture and the relationship between farming and industry. His loss is particularly heavy at this time when the country is using its every resource to win the war. However, we are fortunate in having the modern research organization he did so much to build."

With a well-rounded past of actual farm experience and service in several important agricultural college posts, Dr. Knight in 1927 became Chief of the Nation's Bureau of Chemistry and Soils (the present Bureau of Agricultural Chemistry and Engineering). In this capacity, one of his outstanding services during the past few years was the organizing and establishing of the four Regional Research Laboratories provided for by Congress in 1938. These laboratories have been planned for the development of industrial uses of farm crops, and their research men are now engaged on many problems important in the furtherance of our interests in the war. It is safe to say that many of these findings will be just as important in keeping agriculture on a level keel with other industries long after the war.

Dr. Knight and his work will long be remembered.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilisers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ The Agronomy or Soils Department in the various Experiment Stations in increasing numbers is compiling information on the tonnage of the fertilizer grades sold, and this month there are a number of these listed below. Space prevents going into detail on these, but a few interesting points will be mentioned. In Illinois by far the leading analysis was 2-12-6 with the next leading analyses, 0-12-12 and 3-12-12, only about one-third the tonnage each. Others included 0-8-24, 2-8-16, and 2-16-8, all 2,000 tons or more. Rock phosphate, 20% superphosphate, and sulfate of ammonia also sold in large quantities, the rock phosphate tonnage being estimated higher than all other materials tonnage combined. In 1937, 73% of the mixed fertilizer analyzed 20% or over of plant food; while in 1941, 92% contained more than 20% plant food.

In Indiana again the 2-12-6 was by far the most popular single analysis with 0-12-12 second in popularity followed by 20% superphosphate, 0-14-6, 0-8-24, 3-12-12, and 0-20-20. In Iowa 2-12-6 led, followed by 20% superphosphate, 3-14-6, 0-9-27, and 0-12-12. In Louisiana 4-8-4 was the most popular analysis followed by nitrate of soda, 6-10-7, 4-12-4, and 6-8-4. This State also publishes detailed information on the tonnage of analyses and materials used in each Parish. In North Carolina during the first six months of 1941 the leading grade was 3-8-3, followed by 3-8-5. There was then quite a drop in tonnage to the next popular grade which was the 4-8-4, and this was followed in turn by 3-10-6, 5-7-5, 2-10-6, and 3-8-6, all with 20,000 tons or more.

Bulletin 449 of the Missouri Experiment Station gives the registration, analysis, and tonnage of fertilizers in 1941. The most popular grade in this State was 0-20-0, followed by 2-12-2. There was quite a drop registered for the next grade, which was 2-12-6. This in turn was followed by 0-16-0, 2-12-4, 4-12-4, 4-16-4, 3-9-18, 0-45-0, 0-18-0, all with 1,000 tons or more. In 1934 20% of the fertilizer contained 20 or more units of plant food, while in 1941 this proportion had risen to nearly 47%. Unless otherwise noted, the above figures all refer to the fertilizer year 1940-41.

In Canada figures on the fertilizer trade for 1940-41 have been issued by the Canadian Department of Trade and Commerce. Detailed information on the tonnage of analyses sold by Province and exportation is given. The 2-12-6 is the most popular analysis, followed by 4-8-10, with a big drop to the 2-10-8, which is closely followed by 2-12-10. The 0-12-6 is the only other analysis selling more than 10,000 tons in Canada. These figures refer only to fertilizer. A large tonnage of superphosphate and a much smaller tonnage of ammonium phosphate, as well as other materials, also are sold. Ontario consumes more fertilizer than any other Province, followed by Quebec, with a big drop to New Brunswick, Nova Scotia, Prince Edward Island, and British Columbia, in order. The Prairie Provinces consume very little fertilizer.

Detailed information on the plant food sold by Provinces also is given.

An interesting compilation of the nitrogen, phosphoric acid, potash, and lime removed from the soil by important crops grown in Ohio has been compiled by J. S. Slipher and issued as a Mimeograph Sheet by the Ohio State University. The data have been calculated on a bushel or a ton basis, and on an acre basis for corn, wheat, barley, oats, soybeans, sugar beets, tobacco, red clover, alfalfa, sweet clover, lespedeza, and timothy.

¶ Brief notes on the fertilization of soybeans are given by A. L. Lang and L. B. Miller in Illinois Experiment Station mimeograph pamphlet AG1087, "What About Fertilizing Soybeans?" The nutrient removal of this crop compared with several other standard crops is given, showing that soybeans make a very heavy drain on the mineral elements in the soil. This crop also contains large amounts of nitrogen but, of course, a large portion of this can be obtained from the air due to the nitrogen-fixing capacity of soybeans. The authors bring out that common with much other work on this crop, results from fertilization have frequently been disappointing. They found a favorable response to fertilizers only on the potash-deficient soils. In the work so far conducted they have not had promising results from plowing down heavy applications of fertilizer. The authors recommend the use of lime on acid soil and the use of high-potash mixer fertilizer such as 0-9-27 or straight muriate of potash on potash-deficient soils. Care should be taken that little or none of the fertilizer comes in direct contact with the seed.

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"The Fertilizer Trade in Canada, July 1, 1940-June 30, 1941," Dom. Bu. of Statistics, Ottawa, Ont., W. H. Losee.

"Official Results of Fertilizer Analyses for the Registration Year 1940-41," Dept. of Agr., Ottawa, Canada.

"Commercial Fertilizers Inspected and Analyzed in the State of Georgia 1941," Dept. of Agr., Atlanta, Ga., Serial No. 126, Jan. 1942.

"The Laws, Rules and Regulations Governing the Analysis, Manufacture, Sale and Inspection of Fertilizer, Fertilizer Materials and Cotton Seed Meal in the State of Georgia," Dept. of Agr., Atlanta, Ga., Jan. 1, 1942.

"The Problem of Phosphate Fertilizers," Agr. Exp. Sta., Urbana, Ill., Bul. 484, Apr. 1942, E. E. DeTurk.

"Fertilizers Sold in Illinois in 1941", Dept. of Agron., Urbana, Ill., May 1942.

"Fertilizer Tonnage Sold in Indiana in 1941 as Reported by Fertilizer Manufacturers," Dept. of Chem., Purdue Univ., Lafayette, Ind.

"Fertilizer Consumption in Iowa—1941," Dept. of Agron., Iowa State College, Ames, Iowa.

"Results of Cooperative Basic Slag Demonstrations with Winter Legumes, Summer Legumes and Pastures for 1939-40," La. State University & A & M College, Ext. Cir. 206, Feb. 1941, R. A. Wasson.

"Tonnage Showing the Different Grades of Fertilizer Shipped in the State of Louisiana from Sept. 1, 1941 to June 15, 1942," Dept. of Agron., La. State Univ., University, La.

"Louisiana—Tabulation Showing Tonnage of the Different Grades of Fertilizer Shipped to each Parish in the State from Sept. 1, 1941 to June 15, 1942."

"Amounts of Manure and Fertilizer to Use in Home Vegetable Gardens," Special Cir. 77, March 1942, Agr. Ext. Serv., Amherst, Mass.

"Registration, Labeling and Inspection of Commercial Fertilizers; 1941," Agr. Exp. Sta., Columbia, Mo., Bul. 449, July 1942, L. D. Haigh, E. W. Cowan, and V. B. Williams.

"Buying Fertilizers Wisely," Agr. Exp. Sta., Columbia, Mo., Cir. 227, Apr. 1942, L. D. Haigh and Wm. A. Albrecht.

"Growing Vegetables with Fertilizer in Water," Agr. Exp. Sta., New Brunswick, N. J., Bul. 694, June 1942, V. A. Tiedjens and L. G. Schermerhorn.

"Analyses of Commercial Fertilizers, Manures and Agricultural Lime, 1941," Agr. Exp. Sta., New Brunswick, N. J., Insp. Series 5, Dec. 1941, Charles S. Cathcart.

"More Effective Use of Fertilizers," Agr. Exp. Sta., New Brunswick, N. J., Cir. 420, Feb. 1942, Firman E. Bear.

"Use of Phosphatic Fertilizers on Alfalfa," Agr. Exp. Sta., State College, N. M., Bul. 289, Mar. 1942, D. A. Hinkle.

"Manure — A Wartime Fertilizer," Agr. Ext. Serv., Ithaca, N. Y., Bul. 486, Mar. 1942, R. B. Child.

"Fertilize Victory Wise," Agr. Ext. Serv., Ithaca, N. Y., Bul. 497, Apr. 1942, E. L. Worthen.

"Fertilizing Strawberries in North Carolina," Agr. Exp. Sta., Raleigh, N. C., Bul. 332, Mar. 1942, R. A. Lineberry and E. R. Collins.

"Fertilizer Sales by Grade in Order of Ton-

nage, Jan. 1, 1940-June 30, 1940; July 1, 1940-Dec. 31, 1940; Jan. 1, 1941-June 30, 1941," Dept. of Agr., Raleigh, N. C.

"Analyses of Commercial Fertilizers, Fall 1940-Spring 1941," Dept. of Agr., Raleigh, N. C., W. Kerr Scott, D. S. Coltrane.

"Crops Consume Nutrients," Col. of Agr., Columbus, Ohio, April 1942, John A. Slipher.

"Fertilizer Tonnage for West Virginia," Dept. of Agron. and Genetics, Col. of Agr., Morgantown, West Va.

"A Ten-Year Fertilizer Experiment on Tobacco," Agr. Exp. Sta., Madison, Wis., Res. Bul. 141, Dec. 1941, James Johnson and William B. Ogden.

Soils

¶ A survey of soil fertility and fertilizer practices in the truck crop section of Ontario has been made by T. H. Jones, R. Goodwin-Wilson, and J. H. L. Truscott. The results have been published as Bulletin No. 421 of the Ontario Department of Agriculture, entitled "The Value of Soil Analyses as an Aid in Truck Crop Production in Ontario." As a result of this rather extensive investigation, the authors came to the conclusion that soil analyses by the rapid test method can furnish reasonably accurate information on the nutrient status of the soil and the crop likely to be produced so far as the nutrients involved are concerned. They also feel that by the use of such tests growers will be able to fertilize more nearly according to the actual need of the soil and the crop under consideration, thereby greatly increasing the efficiency of fertilizer usage over present practices. Considerable detailed information on the nutrient levels of soils, fertilizer applied, and cropping conditions is given.

¶ Circular 218 of the Missouri Agricultural Experiment Station, entitled "Liming Missouri Soils," by O. T. Coleman and A. W. Klemme gives practical information on the lime removed by crops and that lost by leaching and erosion, the general lime requirements of soils in the various parts of the State, testing soils for lime requirements, the lime requirements of various crops, results from the use of lime, forms and fineness of lime, and its application. The authors call attention to the fact that lime will not substitute for other soil nutrients, but that fertilizers and lime supplement each other. They recommend that on soils low on organic matter which have not recently grown legumes or had an application of manure, fertilizer such as 4-16-4 or 4-12-4 should be used in addition to the required amounts of lime. On soils high in organic matter they say phosphate alone usually should be applied after liming. Where lime deficiency has been corrected and legumes have been grown frequently, fertilizer such as 0-20-10, 0-12-12, or 0-20-20 is recommended.

¶ The New Jersey Experiment Station has issued two bulletins on soil organic matter. The first, Circular 422, entitled "Soil Organic Matter," was prepared by a committee composed of Experiment Station officials. This publication is in the form of questions and answers and covers the information usually desired by farmers in connection with this important subject. The other publication, Circular 435, by H. R. Cox, is entitled "Resting the Land for Future Gains." This deals mostly with the use of green manure or cover crops and shows farmers in a practical way how they can grow these crops in their usual cropping system. It also discusses the feasibility of taking a year out on part of the farm to grow a green manure crop.

¶ Circular 425 of the New Jersey Agricultural Experiment Station, "Apple Soils and their Management in South Jersey," by O. W. Davidson, contains information of great value to every present and prospective fruit grower. In this short circular the author has presented practical information on the soil and fertility aspects of fruit growing. Much disappointment as well as financial loss could be avoided if all interested in fruit growing would read this circular before venturing into the enterprise. The importance of proper soil, the limitations involved in trying

to use soils unadapted for orchards, and the importance of proper soil management, including organic matter, liming, and fertilization, are explained. In general a complete fertilizer such as 3-12-6 or 5-10-5 is recommended, with additional nitrogen as needed to keep the tree in the condition desired.

¶ The Soil Conservation Service of the U. S. Department of Agriculture has issued an unusual publication on the management of a farm so as to reduce and control soil erosion, and at the same time have a practical and profitable enterprise. This is issued as Miscellaneous Publication No. 486 entitled "Team Work to Save Soil and Increase Production." It was written by P. A. Waring, a farmer in Bucks County, Pennsylvania. The text is written in a familiar style with the subject matter based on personal, practical experience. Numerous striking illustrations occur throughout the bulletin.

"The Productive Capacity of Semiarid Soils and the Present Emergency," Agr. Exp. Sta., Tucson, Ariz., Bul. 182, Mar. 1942, W. T. McGeorge.

"The Value of Soil Analyses as an Aid in Truck Crop Production in Ontario," Ont. Agr. Col., Guelph, Ont., Bul. 421, Apr. 1942, T. H. Jones, R. Goodwin-Wilson, and J. H. L. Truscott.

"Soil Fertility Level as It Influences Plant Nutrient Composition and Consumption," Agr. Exp. Sta., Lafayette, Ind., Bul. 468, Apr. 1942, Robert E. Lucas, George D. Scarseth, and Dale H. Sieling.

"Soil Conservation Districts in Maine," Agr. Ext. Serv., Orono, Maine, Cir. 153, Jan. 1942.

"Lining Missouri Soils," Agr. Exp. Sta., Columbia, Mo., Cir. 218, Dec. 1941, O. T. Coleman and A. W. Klemme.

"Soil Organic Matter," Agr. Exp. Sta., New Brunswick, N. J., Cir. 422, Apr. 1942, F. E. Bear, H. R. Cox, J. S. Joffe, J. W. Shive, H. B. Sprague, V. A. Tiedjens, and S. A. Waksman.

"Apple Soils and Their Management in South Jersey," Agr. Exp. Sta., New Brunswick, N. J., Cir. 425, April 1942, O. W. Davidson.

"Resting the Land for Future Gains," Agr. Exp. Sta., New Brunswick, N. J., Cir. 435, April 1942, H. R. Cox.

"Lime for New York Soils," Agr. Ext. Serv., Ithaca, N. Y., Bul. 488, April 1942, A. F. Gustafson.

"Conservation and Better Land Use for Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Bul. B-257, May 1942, Harley A. Daniel, Harry M. Elwell, and H. F. Murphy.

"Progress Report of Land Reclamation and Pasture Investigations on Abandoned and Scrubby Oak Areas in Central Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Mimeo. Cir. M-86, April 1942, Harry M. Elwell.

"Some Physical and Chemical Properties of the Principal Orchard Soils in the Eastern Panhandle of West Virginia," Agr. Exp. Sta., Morgantown, W. Va., Bul. 303, March 1942, G. M. Browning and R. H. Sudds.

"A Survey of Tobacco Soils in Wisconsin," Agr. Exp. Sta., Madison, Wis., Bul. 142, Jan. 1942, James Johnson and W. B. Ogden.

"Plowing Terraced Land," U. S. Dept. of Agr., Washington, D. C. Leaf. 214, Mar. 1942, E. G. Johnson.

"Soil Survey, McKenzie County, North Dakota," U. S. D. A., Washington, D. C., Series 1933, No. 37, Mar. 1942, M. J. Edwards and J. K. Ableiter.

"Soil Survey, Maverick County, Texas," U. S. D. A., Washington, D. C., Series 1936, No. 10, Jan. 1942, Howard M. Smith, R. M. Marshall, and I. C. Mowery.

"Teamwork to Save Soil and Increase Production," U. S. D. A. Washington, D. C., Misc. Pub. No. 486, May 1942, P. A. Waring.

"Save Your Soil," U. S. D. A. Washington, D. C., Cons. Folder No. 7.

"Grassed Waterways Are Safe Ways," U. S. D. A., Washington, D. C., Soil Cons. Ser. 1942.

Crops

¶ The greatly increased demand being made on American agriculture for meat and dairy production calls for the most efficient production that is possible if the desired quantities are to be obtained. One of the most important factors in efficient animal production is the proper utilization of pastures. To help farmers improve their pastures, Experiment Stations have been issuing a number of pasture bulletins, some of which are briefly summarized this month. The South Carolina Agricultural Extension Service has revised its Bulletin No. 99, "Permanent Pastures for South Carolina." This is a rather complete treatise of the subject and gives information on the management, fertilization, liming, seeding, improvement, and maintenance of pastures. When establishing a new pasture or improving an old one, liming is usually

one of the first things that needs to be done. Fertilization also is necessary. To get a quick start some complete fertilizer such as 4-12-4 at 300 to 600 lbs. per acre is recommended. After this an annual application of 200 lbs. of superphosphate and an application of 100 lbs. of muriate of potash every three or four years are suggested in order to maintain the pastures in good condition. Manure, when available, also is very good as a pasture fertilizer. It is pointed out that poor soil will not produce good pasture. Therefore, it is necessary to build up poor soils and maintain fertile soils by proper management practices.

¶ The South Carolina Extension Service has also issued a very helpful pamphlet on pastures, Circular 208, "New Permanent Pastures for South Carolina." The information is presented in diagrammatic form for quick reference. Each factor in producing or maintaining a good pasture is considered as a step, 12 in all being given. In connection with fertilization it is stated that one of the following treatments should be given: (1) 2,000 lbs. of limestone, 500 lbs. basic slag, 400 to 600 lbs. 4-12-4 or 6-12-6; (2) 1,500 lbs. basic slag, 75 lbs. muriate of potash; (3) 2,000 lbs. limestone, 400 lbs. 20% superphosphate, and 75 lbs. muriate of potash.

¶ Louisiana Experiment Station Bulletin 341, "Profitable Permanent Pastures for Dairy Cattle," by D. M. Seath, summarizes results of pasture investigations in that State and makes recommendations based on this work. It was found that a fertilized pasture permitted a 57% increase in the number of days grazed and a 58% increase in the cow days per acre over unfertilized pasture. There were a 64% increase in milk production per acre and a 44% increase in the net return per acre for the fertilized over the unfertilized pasture. This shows very clearly the value of proper fertilization. In this work 350 lbs. of 4-12-4 fertilizer were used in the fall and a top-dressing of 50 lbs. of nitrate of soda in the spring. Similar results in increased hay yield from fertilization also were obtained.

¶ In Pennsylvania a so-called triple-purpose pasture has been developed and is explained in Pennsylvania Extension Leaflet 78, entitled "Triple-Purpose Pastures," by F. V. Grau and J. B. R. Dickey. These intensively managed pastures may be used for grass silage or hay when not needed for pasturing, the reason why the system is called triple-purpose pasture. A mixture of grasses and legumes is seeded, and on fertile soil the normal fertilization of a small grain usually is considered sufficient to start the pasture. If the soil has not been manured recently or if it is not very fertile, 300 to 400 lbs. of 4-16-4 or 3-12-6 are recommended at seeding time. In addition there should be a top-dressing each year with manure and phosphate, or if no manure is available, with 300 lbs. of 0-14-6 or 0-20-10.

¶ Planting various crops in order to produce pasturage over a large portion of the year is covered in West Virginia Agricultural Extension Circular WS-2, entitled "Supplementary Pastures." It shows that by the use of small grains, sweet clover, lespedeza, alfalfa, Ladino clover, and Sudan grass to supplement the Kentucky bluegrass pasture, pasturage can be obtained over a seven-months period, whereas the ordinary pasture alone usually furnishes adequate grazing only in the spring and early summer.

¶ A general bulletin on pasture establishment and management, particularly from the viewpoint of soil conservation, is Farmers' Bulletin No. 1900 of the U. S. Department of Agriculture, entitled "Pastures to Hold and Enrich the Soil," by A. T. Semple and M. A. Hein. These authors point out the fallacy of taking very poor land and trying to make a pasture out of it.

Such land should be devoted to woodland or, where drainage is poor, possibly to ponds for growing wild life. Good practical information on a pasture program is given for the Southeast and the Corn Belt with much of the general information suitable for other areas. Pasture crops for the areas under consideration, ways of combating soil erosion, and examples of how to plan pasture areas in connection with contour farming are given.

¶ Much interest has been aroused in the growing of fish on the farm by articles in this magazine and others. These articles are based mostly on work conducted by the Alabama Experiment Station. The Station has now issued Bulletin 254, "Management of Farm Fish Ponds," by H. S. Swingle and E. V. Smith. The importance of proper food supply for the fish in the pond is brought out by striking photographs. Rather detailed information on the management of ponds from the viewpoint of species of fish that are suitable, the application of fertilizers, weed control, mosquito control, and harvesting the fish crop is given. Under fertilization it is recommended that 100 lbs. of 6-8-4 fertilizer plus 10 lbs. of nitrate of soda should be applied per acre of water. The application should usually be made about once a month, but this will depend on the amount of overflow and other conditions. The authors point out, however, that one or two applications a year are likely to be dissappointing since they do not supply enough nutrients to favor the growth of the algae and other microscopic plants which directly and indirectly furnish the food for the fish.

¶ Two bulletins dealing with the growing of vegetables in the Northeastern part of the country have recently appeared. The Connecticut Agricultural Experiment Station has issued Circular 150, "The Home Vegetable Garden," and the Vermont Agricultural Extension Service has issued Circular 109, "Vegetable Gardening in Vermont" by C. H. Blasberg. Both of these furnish practical information on the location of the garden, the use of manure, lime, and fertilizers, amount and kind of vegetables to plant, and pest and disease control. The Vermont publication gives more detailed information on many of these subjects than the Connecticut bulletin, but both publications have a great deal of valuable information for the small vegetable gardener. The advantage of using manure when it is available and the necessity of supplementing this with good applications of fertilizers are well brought out. Fertilizers in the 1-1-1 and the 1-2-2 ratio are given particular prominence, while the Connecticut bulletin also mentions the 1-2-2 or 1-3-1 ratios for heavy soils. Fertilizers such as 10-10-10, 7-7-7, 5-10-10, 8-16-16, 5-8-7, and 5-10-5 are suggested. The rate of application recommended is 20 to 50 pounds per thousand square feet. Information on top-dressing also is given.

"Vetch Varieties for Soil Improvement and Seed Production in Alabama," Agr. Exp. Sta., Auburn, Ala., Bul. 253, Mar. 1942, H. R. Albrecht.

"Management of Farm Fish Ponds," Agr. Exp. Sta., Auburn, Ala., Bul. 254, April 1942, H. S. Swingle and E. V. Smith.

"Edible Soybeans," Agr. Exp. Sta., Auburn, Ala., Bul. 255, April 1942, W. C. Sherman and H. R. Albrecht.

"Fifty-second Annual Report for the Year Ending June 30, 1941," Agr. Exp. Sta., Tucson, Ariz., Feb. 1, 1942.

"Wheat Production in California," University of Calif., Berkeley, Calif., Bul. 659, Dec. 1941, C. A. Suneson and F. N. Briggs.

"The Use of Annual Forages," Agr. Supplies Board, Ottawa, Canada, Sp. Pamph. 20, Feb. 1941, F. S. Nowosad and L. H. Newman.

"Barley in the Prairie Provinces," Agr. Supplies Board, Ottawa, Canada, Sp. Pamph. 62, Apr. 1942.

"Making Grass and Legume Silage without Preservatives," Agr. Supplies Board, Ottawa, Canada, Sp. Pamph. 66, P. O. Ripley.

"Sour Cherry Production in Colorado," Agr. Exp. Sta., Fort Collins, Col., Bul. 471, May 1942, L. R. Bryant and Robert Gardner.

"Rate and Date of Seeding Winter Wheat in Colorado," Agr. Exp. Sta., Fort Collins, Col., Bul. 472, June 1942, D. W. Robertson, J. F. Brandon, H. Fellows, O. H. Coleman, and J. J. Curtis.

"Distribution of Roots of Certain Tree Species in Two Connecticut Soils," Agr. Exp. Sta., New Haven, Conn., Bul. 454, Jan. 1942, George Illichevsky Garin.

"Tobacco Substation at Windsor, Report for 1941," Agr. Exp. Sta., New Haven, Conn., Bul. 457, May 1942, P. J. Anderson and T. R. Swanback.

"The Home Vegetable Garden," Agr. Exp. Sta., New Haven, Conn., Cir. 150, Feb. 1942.

"Green Manure and Cover Crops," Agr. Ext. Serv., Newark, Del., Wartime Ext. Folder 1, July 1942, Claude E. Phillips and Eugene P. Brasher.

"A Year's Progress in Solving Farm Problems of Illinois, 1937-38," Agr. Exp. Sta., Urbana, Ill., 51st Ann. Rpt., March 1942, H. W. Mumford.

"Soybeans—A War Crop," Univ. of Ill., Urbana, Ill., Cir. 527, J. C. Hackleman and W. L. Burlison.

"What About Fertilizing Soybeans?" Agr. Ext. Serv., Urbana, Ill., AG1087, Apr. 1942, A. L. Lang and L. B. Miller.

"Research Solves Farm Problems," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., 54th Ann. Report, June 30, 1941, H. J. Reed.

"Soybean Varieties and Culture," Purdue Univ. Agron., Leaflet May 1942.

"Report on Agricultural Research for the Year Ending June 30, 1941," Part 1, Agr. Exp. Sta., Ames, Ia., R. E. Buchanan.

"Report on Agricultural Research for Year Ending June 30, 1941," Ia. Corn Research Inst., Ames, Ia., Sixth Ann. Rpt.

"The Iowa Farm Service Guide," Agr. Exp. Sta., Ames, Ia., Bul. P34, Oct. 1941, John A. Vieg.

"Vegetable Soybeans," Agr. Exp. Sta., Ames, Ia., Bul. P39, Feb. 1942, M. G. Weiss, C. P. Wilsie, B. Lowe, and P. M. Nelson.

"Victory Vegetable Garden," Agr. Exp. Sta., Ames, Ia., Bul. P40, Mar. 1942, E. S. Haber.

"Growing Potatoes in Iowa," Agr. Exp. Sta., Ames, Ia., Bul. P41, Mar. 1942, E. S. Haber.

"Profitable Permanent Pastures for Dairy Cattle," Agr. Exp. Sta., University, La., Bul. 341, Mar. 1942, D. M. Seath.

"Controlling Garden Insects and Diseases," Agr. Exp. Sta., Orono, Me., Ext. Cir. 162, June 1942.

"Recent Progress with Canning Crops in Maine," Agr. Exp. Sta., Orono, Me., Ext. Bul. 304, May 1942.

"Small Grain Production in the Lowland Region of Southeast Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 440, Jan. 1942, B. M. King.

"Growing Sorghum and Making Sorghum Sirup," Agr. Exp. Sta., Columbia, Mo., Cir. 235, May 1942, C. A. Helm and Robert Beasley.

"Strawberries in Nebraska," Agr. Exp. Sta., Lincoln, Neb., Cir. 11, Mar. 1942, C. C. Wiggans.

"Rubber From Rabbit Brush," Agr. Exp. Sta., Carson City, Nev., Bul. 157, Mar. 1942, S. B. Doten.

"Influence of Thiamin Additions on Germination and Growth of Certain Grasses and of White Clover," Agr. Exp. Sta., New Brunswick, N. J., Bul. 692, April 1942, G. H. Ahlgren.

"Corn Growing for High Yields and Low Costs Per Bushel," Agr. Exp. Sta., New Brunswick, N. J., Cir. 427, April 1942, Howard B. Sprague.

"Corn Hybrids for New Jersey," Agr. Exp. Sta., New Brunswick, N. J., Cir. 429, April 1942, Carlton S. Garrison.

"Strawberries for the Home Garden," Agr. Exp. Sta., New Brunswick, N. J., Cir. 436, April 1942, J. Harold Clark.

"High Quality Hay Production," Agr. Exp. Sta., New Brunswick, N. J., Cir. 440, May 1942, G. H. Ahlgren and Carl B. Bender.

"Fifty-Second Annual Report," 1940-1941, Agr. Exp. Sta., State College, N. M., Fabian Garcia.

"Hay for the Dairy Herd," Agr. Ext. Serv., Ithaca, N. Y., Bul. 479, Mar. 1942, E. S. Harrison and H. B. Hartwig.

"Emergency Hay Crops," Agr. Ext. Serv., Ithaca, N. Y., Bul. 481, Mar. 1942, George H. Serviss and John H. Barron.

"Cannery Peas," Agr. Ext. Serv., Ithaca, N. Y., Bul. 485, Mar. 1942, M. C. Bond, Charles Chupp, Hugh Glasgow, R. W. Leiby, G. L. McNew, C. B. Raymond, M. E. Robinson, and C. B. Sayre.

"Cannery Tomatoes," Agr. Ext. Serv., Ithaca, N. Y., Bul. 487, Apr. 1942, Charles Chupp, G. E. R. Hervey, T. E. LaMont, R. W. Leiby, G. L. McNew, M. E. Robinson, and C. B. Sayre.

"Soybeans," Agr. Ext. Serv., Ithaca, N. Y., Bul. 496, Apr. 1942, R. G. Wiggans, F. B. Morrison, and G. H. Serviss.

"Experiments with Field Beans," Agr. Exp. Sta., Ithaca, N. Y., Bul. 776, Feb. 1942, E. V. Hardenburg.

"Three Years' Operation of an Experimental Sugar Bush," Agr. Exp. Sta., Geneva, N. Y., Bul. 699, Jan. 1942, C. J. Tressler and W. I Zimmerman.

"Orchard Covers and Their Relation to Soil Conservation," Agr. Exp. Sta., Geneva, N. Y., Bul. 701, Mar. 1942, R. C. Collison and E. A. Carleton.

"Raspberry Growing in New York: Culture, Disease, and Insects," Agr. Exp. Sta., Geneva, N. Y., Cir. 153, May 1942, G. L. Slate, R. F. Suit, and F. G. Mundinger.

"Blackberries and Dewberries," Agr. Exp. Sta., Geneva, N. Y., Cir. 193, May 1942, George L. Slate.

"Grazing Investigations on the Northern Great Plains," Agr. Exp. Sta., Fargo, N. Dak., Bul. 308, Dec. 1941, J. T. Sarvis.

"Bounty Tomato in Standard Yield Trials in 1940 and 1941," Agr. Exp. Sta., Fargo,

N. Dak., Bul. 310, Mar. 1942, Harold Mattson.

"Protein and Quality in Hard Red Spring Wheat with Respect to Temperature and Rainfall," Agr. Exp. Sta., Fargo, N. Dak., Bul. 311, Mar. 1942, L. R. Waldron, R. H. Harris, T. E. Stoa, and L. D. Sibbitt.

"Growing Field Beans," Agr. Ext. Serv., Fargo, N. Dak., Sp. Cir. A-9, Mar. 1942.

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Ragweed Adds Quality In Tobacco Rotations

In the early days of this country planters soon found that tobacco grown on virgin soil produced larger yields of finer-textured leaf than that grown on older cultivated plots. Thus, to meet market demands, early settlers and their successors cleared forested areas until in time all the good land had been planted to tobacco.

As farming science developed, tobacco growers tried crop rotation, and used manures and fertilizers in an effort to maintain yield and quality. These practices did not prove satisfactory on all soils and with all crop combinations.

In recent years, scientists of the United States Department of Agriculture discovered that tobacco grown after a natural weed fallow and receiving the right kind of commercial fertilizer apparently possesses those characteristics observed in the early days when the crop was grown on virgin land. The fact that tobacco planted after a bare

fallow shows a rapid decrease in yield and quality demonstrates that the cover of spontaneous growth is the answer to the problem rather than simply allowing the land to remain idle.

Tests completed recently by the Department scientists show that certain weeds are more desirable than others as a fallow. It may not be good news to persons susceptible to hay fever, but ragweed is one of the weed species showing the best results. Horseweed is another. On the other hand, tobacco following lamb's quarter showed some reduction in yield over bare fallow.

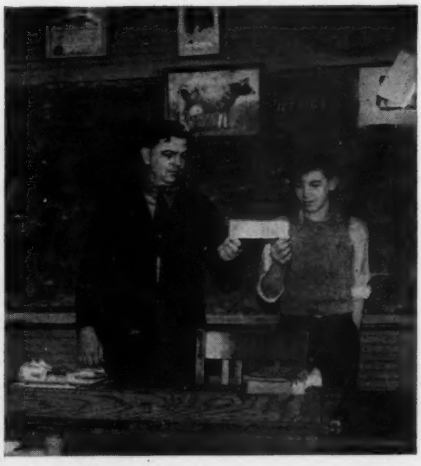
In the same tests annual lespedeza has shown no advantage as a cover crop. Sweetclover, rabbit's foot clover, and wild peas have not always shown an advantage.

The general beneficial effect of the weed fallow, report the scientists, is getting the tobacco off to a quick start and a rapid and uniform growth of the plants from transplanting time to maturity. This in turn resulted in uniformly high market value per acre and average price per pound, which demonstrates that the tobacco meets current demands for most manufacturing purposes.

Cotton Contest Showed Value of Potash

A CONTEST, conducted in 1939 in Woodruff County, Arkansas, which is recognized as a splendid cotton-producing county, clearly demonstrated the value of potash in growing good cotton. Thirty-two boys, members of the Future Farmers of America and students in the Vocational Agriculture Departments of the high schools at Cotton Plant, Augusta, and McCrory, participated. Each participant used 400 pounds of 6-8-8 commercial fertilizer on an acre plot. No special cultivation was given the fertilized plot, the entire crop being cultivated at the same time. However, the plot was carefully staked off, so that there would be no difficulty in determining the weights when the picking began. An adjoining plot, also containing one acre, on which the regular fertilizer practices were followed, was marked for comparison.

Nine of the boys reported gains of more than 500 pounds of seed cotton per acre over similar plots which were fertilized in the regular manner. Records as to the number of visitors to the plots and the cotton weights were carefully kept. The first place winner showed an increase of 958 pounds.



Mr. Richardson, adviser and instructor, and Andrew J. Marsh, first prize winner in the contest.

Another interesting feature was the different types of soil used in the contest, some of the boys living on river bottom farms, others living in a small area which was severely hit by drought

the previous year, and still others located where the land was of a rolling topography. No particular variety of cotton was required, and students were allowed to make their own selection as to the kind of cotton they would grow. There was a negligible amount of cotton blight on the plots fertilized with the 6-8-8.

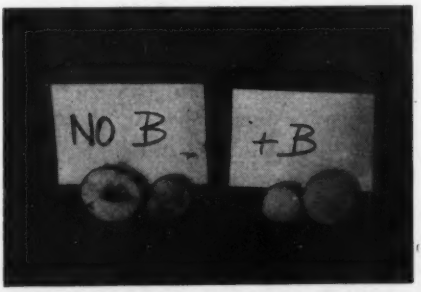
Selection of the winners was by points scored. A total of 85 points was possible, with the boy who won first place making 75 points. The first prize was $7.50, second $5.00, and third $2.50 to the boys ranking in that order, while the Vocational Agriculture Department of Cotton Plant High School was awarded a $15 soil-testing set for winning the sweepstakes.—*Justin Richardson.*

The Southeast Can Grow Clover and Alfalfa

(*From page* 16)

white Dutch clover, kudzu, and sericea-lespedeza."

Boron deficiency in turnips can be determined by examining the roots. If there is a boron deficiency, brown hearts will show when the turnips are cut open. If the deficiency is great, the turnip tops will curl.



Showing brown centers in turnips where no borax was used.

Borax may be applied to turnips or beets by either of three methods: In the drill, broadcast, or as a side-dressing. If it is applied in the drill, it should be done three weeks before the seeds are to be planted; if broadcast, the seeds may be planted immediately after application is made. In the third method, the borax is mixed with sand and put down beside the row and covered lightly.

Doctors Naftel, Ware, and Sommer warn farmers that an over-dose of borax may do considerable damage as it is very toxic to plants. This leads them to advise the use of no more than 15 to 20 pounds per acre. They advise that there is an ample supply of borax available through regular fertilizer dealers.

Fertility Program Makes a Wheat King

(*From page* 13)

form the raw plant-food fertility into merchantable grain and has stuck to it. While many of his neighbors were trying to solve their plant-food problems by acquiring new varieties with miraculous powers of performance on low plant-food supplies, Herb has been immune to the "Variety Change Complex" and has stayed with the old reliable. His main complaint is that where his nitrogen level is too high, the lodging of the wheat is often fatal to the young clover stands.

Although the application of this field judging score card to first the township contests, then the county contests, and last to the area may not have been perfect in every case, it has caused a lot of practical operators to see the relation of the fertility problem to production in a light that it has never been viewed before.

Ladino Field Day

(*From page* 18)

Seeding can be made in oats or barley in the spring, and at least 300 pounds of a 4-12-4 fertilizer per acre should be used. Many farmers who are short on grass for next year are planning to take off their hay crops, plow the old hay sod, lime, and seed the triple-purpose mixture in the early part of August, without a nurse crop. We have found by experience that this seeding should be done in August, and in order to secure the best stands of Ladino, the deadline for seeding should be not much later than August 15.

Many growers have been hesitant in seeding the triple-purpose mixture on account of the presence of orchard grass in the mixture, for fear the orchard grass will become tough. But such is not the case, for if Ladino is cut at the proper time, usually the first week in June, the orchard grass will be in a green, succulent, tender stage. The orchard grass and meadow fescue are regarded as compatible grasses for seeding with Ladino clover. They can withstand the crowding effect of the rapidly growing Ladino and tend to hold or support the Ladino as it matures, thus preventing it from becoming prostrate on the ground or lodging. In seeding the triple-purpose mixture, it is advisable to seed the two grasses, orchard grass and meadow fescue, separate from the legume seed, due to the difference in the sizes of the seed. The legume seeds require shallower seeding than the grasses.

It has been our observation in the County that we can maintain Ladino clover if, after the first cutting season, we fertilize in the fall of each year with at least 300 pounds of 0-20-20 or 0-20-10 fertilizer. If manure is available, a winter application of six to eight tons is also recommended.

The Sterling Farms recently purchased a new and valuable piece of equipment known as the Haymaker. It is a five-foot implement that is attached to and trails the mowing machine. A pick-up attachment picks up the newly cut swath and puts it through two rollers set at a 32nd of an inch. These

The Haymaker, a new piece of equipment which makes hay in half the time, was demonstrated.

rollers crush the stems and lay them out in a swath. This crushing makes possible, with proper haying weather, rapid release of the moisture. John Dershimer, manager of the Sterling Farms, says, "It hastens hay-making and helps retain the natural green color of the hay." Ladino and alfalfa hay-making time, with proper weather, he advises, has been reduced from 96 to 48 hours by the use of this implement. Better color, quality, and less leaf shattering has been the result.

The Field Day at Sordoni's was an inspiration to visiting dairymen. They learned that to be a successful dairyman one must produce an abundance of high-class roughage. Those farmers who have followed the development of Sordoni's Sterling Farms during the past six years are enthusiastic about Ladino. They feel that Ladino is the answer to the dairyman's prayer for roughage of high quality, persistency, and yielding capacity, whether grown for grass-silage, hay, or pasture.

Conserve Nitrogen Now

(*From page* 12)

effective way of quickly meeting any shortage of nitrogen that this emergency may bring about. A little slower, but nevertheless equally important, means of meeting any shortage of nitrogen fertilizer is the greater use of adapted legumes. Those farms which are now producing good stands of alfalfa, sweet clover, or ordinary clovers in mixtures with grasses, need little or no nitrogen for corn and small grains. But, there are too many farms in the Northeast upon which a good stand of legumes is a rarity. Our most useful legumes require moderate to good drainage, plenty of lime, and a good supply of available mineral elements, chiefly potash and phosphate.

There are not many areas now under cultivation which have such poor drainage that alsike clover will not grow, if other conditions are right. There are a great many soils which are entirely too acid for legumes. More than half of the general farm soils and orchard soils which have been analyzed at the Pennsylvania Experiment Station are too acid to grow clover. In most instances, the strongly acid soils are deficient in available phosphate and potash. Acidity in soils tends to reduce the availability of phosphate even though phosphate is applied in soluble fertilizers.

To make these acid-deficient soils capable of growing legumes well, a soil improvement program is essential. Such a program calls for sufficient lime and the building up of the available mineral status by manure or mineral fertilizers or both. Sometimes much of the value of mineral fertilizers may be lost when applied to a dead soil. Failure to get a response may not signify that the minerals are not needed. It may mean that they are being fixed or otherwise rendered unavailable. It is seldom possible to take a strongly acid, biologically inactive soil and make it suitable for lime-loving legumes in one year. However, within two or three years, if active organic matter is added in crop residues or manure and sufficient mineral elements supplied, such a soil may be made suitable for the ordinary legumes.

Another suggestion that may serve as a temporary relief, if nitrogen shortage becomes acute, is aiding the release of soil nitrogen. Soils contain 1,500 to 3,000 pounds of total nitrogen in the surface soil. Most of this is quite resistant to bacterial attack. Liming, sufficient to make the soil nearly neutral, and cultivation to aid bacterial action and eliminate competition will help raise the level of nitrate concentration in the soil. Of course, such a

practice which merely releases some of the stock nitrogen without adding any, and which even invites a loss by run-off and leaching, cannot be continued long without harmful soil destruction. It is, nevertheless, an expedient measure, justifiable while the emergency exists.

In this article certain practices are suggested which are calculated to help growers to cope with an impending shortage of fertilizer nitrogen. Some of the practices suggested would be equally valuable any time, others are suggested solely as emergency measures.

The One-Mule Farmer Needs a New Machine

(*From page* 22)

exclusive of the time lost in turning at the ends of the rows and in servicing the machine. If the machine is operated by one man and one mule, this figure would represent either man-hours per acre or mule-hours per acre. The power, expressed in horsepower hours per acre (arithmetical results of multiplying horsepower by the time in hours required for one acre), will allow direct comparison to be made between two machines or between two methods. For example, one machine may require two horsepower and will cover one acre of land in one hour. A second machine may require one horsepower and take three hours to cover the acre. Although the first machine required twice as much horsepower as the second, the latter machine has the real advantage for the total amount of energy expended in covering the acre. The horsepower hours per acre being 2 x 1 or two horsepower hours per acre for the first machine and 1 x 3 or three horsepower hours per acre for the second machine. All calculations were made for a row spacing of 3½ feet.

Chart No. 1 gives the draft, labor, and power requirements of five methods of fertilizing and planting cotton seed, and one method for fertilizing and bedding for tobacco. With the exception of the experimental machine, these methods are all commonly used on North Carolina farms. This is the result of one year's study under one set of conditions.

Particular attention is called to the once-over machine, Method No. 1, which shows considerable saving in both labor and power because all operations are accomplished in one trip. The commercial two-mule, riding, once-over machine, Fig. 3 and Method No. 3, requires approximately two times as many mule-hours per acre and two times as much power as the walking, once-over machine.

Of particular significance is the fact that the draft of the walking, once-over is about the same as that required of each mule on the riding, once-over machine (138 and 263 lbs. respectively). This walking, once-over machine would, therefore, be economically superior to the two-mule, riding machine.

It has been estimated by Brody and Trowbridge [2] that a horse can efficiently pull 10 per cent of the body weight when walking at 2½ miles per hour. This is calculated on the basis of working every day 6 to 10 hours. A safe estimate for an average work animal in North Carolina would be about 150 pounds of draft where the mule is worked seasonally. The draft of 138 pounds for the once-over machine, would be within a safe limit. As a basis of comparison, it is interesting to note that this once-over machine, which does all the operations of planting in one trip, requires only 138 pounds of draft while the 7-inch turning plow, Method No. 4, required an average of 145 pounds to do the bedding operation alone.

[2] Bulletin No. 383, "Efficiency of Horses, Men and Motors," University of Missouri.

These studies indicate that many of the one-mule commercial machines could be modified to increase their efficiency. For example, if the manufacturer of the distributor used in Method No. 2 had equipped his machine with a planter, the draft, labor, and power would compare very favorably with the once-over machine. If the manufacturer of the distributor used in Method No. 4 had equipped his machine with bedding discs and a seed planter, the draft, labor, and power would compare favorably with the once-over machine. Method No. 5 is very inefficient, partially because it involves five operations and partially because the shovels that mix the fertilizer with the soil in the furrow require a large amount of power.

Method No. 6 gives the requirements for opening a furrow, which most farmers do regardless of the machine method used. This is necessary where the fertilizer is placed in a furrow under the seed, but has no advantage where the fertilizer is side-placed except that it may help to make a straight row.

Method No. 7 is for the once-over machine when used for fertilizing and bedding for sweet potatoes, tobacco, and other transplanted crops. The commercial distributor used in Method No. 2 and shown in Fig. 5 may be adjusted to throw up a bed desirable for transplanted crops. When properly adjusted, the power requirement would be approximately the same as for the once-over machine. The advantage for the once-over, over this machine, would be in the accurate side-placement of the fertilizer so that the plants may be set between the bands of fertilizer to avoid injury to the plants. The operations used in Method No. 5 for planting cotton would be the same as for transplanted crops with the exception that the planter would be omitted. This method would require approximately three times more labor and three times more power than the once-over.

Conclusion

These studies show that a once-over, side-placement machine can be built which will save labor and power, give more efficient use of fertilizer, give better stands and higher yields. The one-mule farmer should demand such a machine.

Clifton Smith Succeeds on Worn-out Farm

(*From page* 9)

hasn't kept Smith from giving attention to wildlife. Around his two ponds he has woody plantings and food plants which provide a home for game birds. Cane, blackberries, plums, and other food-bearing plants are included. As we walked across the nearby field two pheasants streaked away ahead of us. Quail are numerous.

When we interviewed him on a raw, windy November day with the ground freezing under our feet, we found him mowing a strip of hegari grown on the contour on a terraced field. Having been kept out of the field by wet weather he was bundled up and cutting the forage crop with a grim determination to save and use every bit of feed. And in spite of that, he stopped and talked about soil conservation and what it had helped him do.

"It's easier to tear a farm down than it is to build it up," he said. "The gullies are beginning to heal, the pastures are producing lots of feed, and I don't lose much soil from my grain and cornfields. It will be years before the farm is anywhere near as good as it used to be; but a man can bring it back, and it will make him a living while it's coming back."

And that is the story of how Smith has obtained profitable production from a farm which in 1936, according

to a soil conservation survey made by SCS technicians who helped him with his plans, had lost about three-fourths of the topsoil in most of the fields.

As Mr. Smith gazed over the sloping lands which are his, which are producing a living and an ever-better one, and as he pointed out the terraces, contour tillage, pasture improvement, ponds, and other practices which are rebuilding the topsoil and rooting it to the earth for the future welfare of his family and the community, there was a love of the land and a pride of accomplishment in his eyes which warmed the heart while the raw wind froze the skin.

The new land frontiers of the past century may be closed in this country; but while the land needs soil conservation, while there are man-handled farms to be brought back to a profitable system of agriculture, and while there are families like the Smiths, there'll always be a frontier in the United States.

The Daze Phase

(*From page* 5)

strong farm front at a time when enemies were lurking in nooks and crannies to gloat over this dispersal of a united people.

With the compromise enactment of certain alleviating appropriations for the continuance of localized aids aforesaid, there followed a temporary relaxing of the tension among our farm leaders and followers. If it had not passed, I fear we might have encountered some social troubles of great magnitude. And they would not have confined themselves to the ragged fringe of agriculture either. It is better to spend a few millions in a questionable way than to create conditions of unrest and discord.

Then next we had the wheat feed embroilment. Everybody knows about that and how farmers were rather divided on the issue, between upholding a paper parity principle inviolate on the one hand, and supplying excess grain to livestock during a critical storage season. This too has temporarily eased off with recent legislation. It may help to heal the scars in this case too.

But there is another deeper angle left to bother us. I refer to the division among farmers over the union labor principle and the invasion of half a dozen states by labor organizers who claim to offer a form of militant crusading beyond anything that the existing farm organizations have attempted.

There is nothing new at first glance in such claims. Rival farm organizations and rival political parties have indulged in it. But it is the first time on record that farm organization leadership as a whole has been threatened with an outside force of organized producers, often more skillful and aggressive than the farmers and fortified with ample financial reserves gained through methods denied to or never used by solicitors for farm organizations.

I have just said that farmers themselves are somewhat divided on this issue. By that I mean the backgrounds and platforms of certain farm organizations have in the past reflected different attitudes toward organized union labor.

We have had a minority of such farm groups who tried to keep step with union labor, who insisted that the objectives of farmers and workers were almost identical, who exchanged public speakers and held joint *political* rallies. This last emphasis is what I think is significant. The ties that bound them hitherto were largely political, vote-counting, lobbying, and checking the legislative ballots on mutual measures.

There has never been to any extent the slightest move on the part of farmers and union members to get together on common ground as human beings, parents and home-makers.

This needs proper emphasis at this time. There is an alarming distrust afoot. The inroads of the aforesaid unions seeking membership among farmers alarms the leaders of the pros and the cons alike. But they possess no natural alliance to defend themselves. Their meetings of protest are not convincing, and the feeling among some of the rank and file swings more toward favoring the antics of the union organizers than it does to support the old-line leaders.

The silence on the farm front is disturbing. You do not find many farmers who will say one thing or the other about the issue, not caring to be quoted, maybe fearful of ridicule for secretly joining up with John Lewis and his militant miners. Nobody has the proper answer or finds the right remedy for this disruptive situation.

Yet deep down inside us we know that if farm folks could forget the past mistakes of union leaders and find a sound method of mingling as families and parents and citizens with rank and file members of unions we might get a clearer picture of a united America—a producers' front that would stand the test.

BY this I hold that most of the issues that are being held up as inducements one way or the other are fictitious and unsafe. Our job now is to find means to reach and hold together the common folks who pay the taxes and buy the bonds and do the hard work and keep the organizations solvent.

Can we leave this to the leadership of either side? Can we proceed with the idea that union leaders are going to arrange mutual meetings with rural workers to discuss what each is doing in a humble way to save America? May we safely presume that farm leaders now busy with parity and synthetic rubber plans will set in motion meetings of the rank and file in places where labor and agriculture can join hands on issues they alike hold dear as Americans?

Of course there are areas where such a joint exchange of opinion would not be practical. But there are also sections where vast industrial plants are adjacent to productive farms. It is in such places that the experiment of unity between simple followers (rather than excited leaders) should be made. Until it is tried and found futile I will not give up my plea.

POLITICS and prejudice should not continue to bar the way for willing Americans of the farm and the forge. I am aware that many will disagree and say this is just another Utopian dream. Many believe that our first task is to produce skillfully within our own ranks and not worry any over social values of future problems.

There is some truth to their contention that our leisure time must be spent in relaxation and rest rather than trying to solve distressing perplexities. Every man to his job and the devil take the laggard or the dreamer!

Yet sometimes the future would be better and brighter and easier to live in, and filled with more accomplishment for humanity, if we gave a little time in the present to just such problems.

America was built on dreams and discoveries. I have faith that its future rests on the same strong foundation. If we don't do any of the dreaming and the inventing and the guessing, somebody or some powers having the foresight we lack may do it for us the hard way.

I'd rather risk my neck and whatever feeble reputation I have in vague surmises and vain experiments than to accept the dictum that we must leave things as they are and settle them "when the war is over."

JUSTICE

"One day," said the old countryman from the hills, who was on trial for murder, "when my rheumatism was pestering me, and my daughter had just eloped with a good-for-nothin' scalawag, and my barn had burned down and I lost both my mules, and my best old sow got the cholera and died, and I just heard they had foreclosed the mortgage and the sheriff was lookin' for me, I told my troubles to one of these here optimists, and he said: 'Cheer up, old top, the worst is yet to come!' So I shot him."

A famous and beautiful actress at a dinner party was placed beside a visiting African potentate. She exerted herself to the utmost to entertain her dusky partner. At the close of the dinner he sighed and said, "Madam, if only you were black and fat you would be irresistible!"

"Do you get a nervous feeling when your boy friend pets you?"

"Who, me? Of course not. He isn't nervous."

Way down in Georgia a traveling man found himself stranded for the night and in his rambles around town noticed there were two Baptist churches. He asked a colored man why there should be two churches of the same denomination.

"Well, boss, Ah'll tell you," said the informant. "Dey jus' can't agree. One of de churches believes dat Pharaoh's daughtah found Moses in de bullrushes. De odah church claims dat's what she sez!"

A maiden lady lived in the country with one maid. One morning the bell rang. The maid admitted the visitor, an evacuee officer arranging for homes for children evacuated from London, then rushed upstairs.

"Please mum," she blurted out breathlessly, "you've got to have two babies, and the man's downstairs!"

The track supervisor received the following note from one of his foremen:

"I'm sending in the accident report on Casey's foot, which he struck with the spike maul. Now, under 'Remarks,' do you want mine or Casey's?"

ROUTINE

"Well, well, Rastus, so you're in the Army now! What do you do?"

"Oh, Ah jes flings open dis here gun, den Ah shoves in a shell an a sack of powder, den Ah shets de gun an' pulls dis here string, an' den Ah yells: *'Hitler, count yo' sojers!'*"

The teacher had lectured on the various facets of communism, fascism and nazism. Then turning to the bright pupil, he said: "Johnny, what would you do with all these isms?"

"I'd make them all wasms!" came the prompt reply.

And then there was the student who wrote: "Virgin wool comes from the sheep that can run the fastest."

Need for—

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The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

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Potash Hungry Fruit Trees (Pacific Coast)
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Better Corn (Midwest) and (Northeast)
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Of Course I'm Interested (Pastures, Canada)

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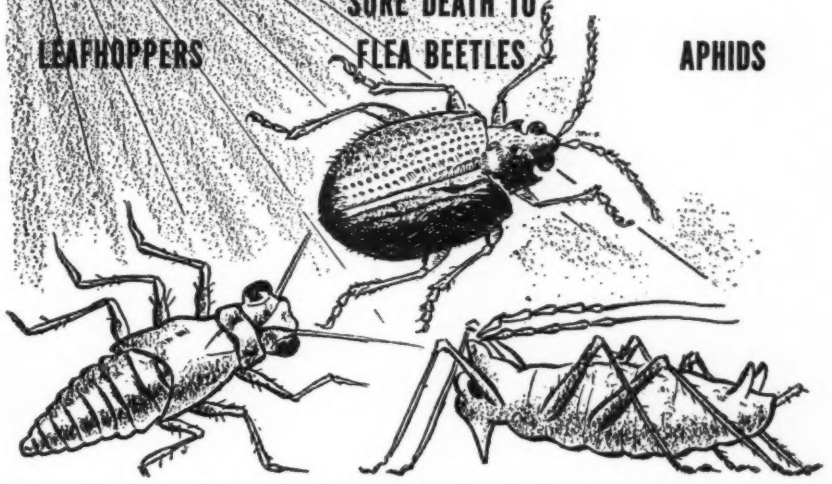

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